PATHOPREVALENCE OF INFECTIOUS DISEASES OF GOAT EMPHASIZING ON ENDOPARASITIC LESIONS AT DINAJPUR SADAR

A THESIS

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MAHFUZA AKTHER

REGISTRATION NO.: 1405087

SEMESTER: JANUARY-JUNE/2015

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MASTER OF SCIENCE (M.S.)

IN

PATHOLOGY

DEPARTMENT OF PATHOLOGY AND PARASITOLOGY

HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR

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Dedicated To My Beloved Parents

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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 (UVH) and District Veterinary Hospital (DVH), 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, Dinajpur Sadar 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.

Key Word: Pathoprevalence, Infectious Diseases, Clinical Examination, Gross and Histopathology

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LIST OF ABBREVIATIONS AND SYMBOLS

%	Percentage
>	More than
&	and
^{o}C	Degree Centigrade
µm	micrometer
BBS	Bangladesh Bureau of Statistics
BBG	Black Bengal Goat
CONTD.	Continued
DVH	District Veterinary Hospital
DLS	Directorate of Livestock Services
et al.	and other
ed.	Edition
FAO	Food and Agricultural Organization
Fig.	Figure
gm	gram
H & E	Hematoxylin and Eosin
JP	Jamunapari
mg	Miligram
ml	Mililiter
No.	Number
PBS	Phosphate Buffer Saline
RTI	Respiratory Tract Infection
ssp.	Species
UVH	Upazilla Veterinary Hospital
UTI	Urinary Tract Infection

CHAPTER I

INTRODUCTION

Bangladesh is an over populated, rural and agrarian country in the world. Livestock is a vital component of rural economy in Bangladesh and is performing multifarious functions such as provisions of food, draft power and transport. Livestock contribute about 2.07%to the GDP (BBS, 2014-2015), of Bangladesh and therein total foreign exchange earning accounts for about 6.2 % (Alam, 1995) in which share of goat is enormous.

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, 1999, and Amin *et al.*, 2001)a nd the remaining ones include the Jamunapari and their crosses.

Traditionally goat rearing is an integral part of` mixed farming in Bangladesh and the contribution of goat to the national economy is valued for high quality meat (28% of the total), milk (23% of total), skin (28% of total) also for poverty alleviation, income generation, creation of employment opportunity and food production (Debnath,1995). The higher demands for meat and especially for skin in the local as well as foreign markets focused the goat enterprise extremely prominent to the vulnerable group of people and the existing socioeconomic condition of the country. They also have important role in generating employment, income, capital storage and improving household nutrition (Devendra, 1992). But there exists a variety of problems in goat rearing of Bangladesh such as insufficient pasture land, lack of technical expert, insufficient supply of vaccine, lack of epidemiologic study and shortage of government employee in the field level and various diseases of different systems of animals. Lack of proper care and overall faulty husbandry practices are also responsible for higher goat mortality in the prevailing production system (Husain *et al*., 1995). Among various problems, diseases play an important role interfering with the development of goat production in our country. The occurrence of diseases is an important factor which influences the productivity and economy of goat farming. Goats suffer from many

animal diseases and some of these are common with other livestock species, while a few are specific to goats only. 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.

Goat usually suffer from many diseases, some of them are infectious and some are noninfectious (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. Many organisms live in and on bodies naturally. They're normally harmless or even helpful, but some organisms under certain conditions may cause disease. Some infectious diseases can be passed from animal to animal and some, however, are transmitted via bites from insects or animals. It is possible that 75% of the emerging and re-emerging pathogens are zoonotic. Therefore, the effect of these diseases on the public's health must always be considered. In many instances sick animals can serve as a cause of infection for humans.

Common infectious diseases encountered in goat such as, Viral diseases like Peste des Petits Ruminants (PPR), goat pox, contagious ecthyma and viral pneumonia, and bacterial diseases such as enterotoxaemia, tetanus, brucellosis, mastitis and metritis, mycotic diseases like ring worm infection, and mixed infections like Urinary Tract Infection, Dermatitis, keratoconjunctivitis are common causes for goat mortality in rural areas. Gastro-intestinal nematodiasis, fascioliasis and tape worm causes less mortality but cause severe depression in the growth and reproductive rate of the Black Bengal Goat (BBG). It was reported that variation in different breed, their sex and environmental factors greatly influence the disease prevalence in livestock animals including goat (Alim *et al*. 2011, Sarker *et al.* 2011, and Islam *et al.* 2014).

These infectious diseases are often being prevented through effective intervention programs targeting the transfer of disease from one animal to other eventually from one farm to another (Charlotte Clifford- Rathert, 2008). Therefore, it is important to be aware of what we can do to protect our farm and our important resource from contamination. For an effective goat disease control program it is pertinent to have a record of common diseases prevalent in an area (Ojo, 1992). A thorough knowledge about the prevalence, epidemiology, pathogenesis and pathology of a particular disease is the first and

fundamental factor for proper diagnosis of diseases, as well as for the prevention, control and eradication of infectious diseases.

Although, different studies have been carried out in various part in 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 infectious diseases of goats in Dinajpur district along with following objectives:

- To investigate the overall prevalence of infectious diseases of goat at Sadar Upazilla, Dinajpur
- To identify the causal agents by clinical and laboratory examination
- To study gross lesions of different organs with the merit of individual diseases
- Histopathology of affected organs collected from suspected goat with endoparasitic diseases.

CHAPTER II

REVIEW OF LITERATURE

In this study, available and relevant literatures are reviewed with the emphasized on the prevalence of different infectious diseases of goat with different parameters of breed, sex, age, season along with clinical signs of affected animals, gross and histopathological changes of collected organs affected with different endoparasites.

2.1. Prevalence of infectious diseases with parameters

Alam *et al.* (2015) were conducted a study and found that among the three types of cases, medicinal cases 428(87.72%) were highest followed surgical cases 43(8.80%) and gynaeco-obstetrical cases 17(3.48%). Among the medicinal cases of goats, the contagious diseases PPR 32(6.56%), black quarter 23(4.73%) fascioliasis 77(15.78%), diarrhoea 35(7.17%), dysentery 30(6.15%), ectoparasitism 30(6.15%),

paramphistomiasis 25(5.12%), gastrointestinal nematodiasis 21(4.3%), fever 20(4.1%) were recorded major disease problems in goats. Among the gynaeco-obstetrical cases, retained placenta 5(1.02%) and repeat breeding 12(2.46 %) were recorded as major gynaeco-obstetrical problems in goats. Abscess 9(1.84 %), castration 4(0.81%), myiasis 10(2.05%), navel-ill 7(1.43%), gid disease 2(0.41%), urolithiasis 5(1.02%) and fracture 6(1.23%) were recognized as the main disorders which required surgical interventions.

Amin (2015) conducted the study and found that the prevalence of parasitic diseases was highest in rainy season 51.28% followed by autumn (41.61%), summer (40.37%) and winter (27.98%). The prevalence of infectious diseases was highest in winter 52.60% followed by autumn (37.55%), summer (37.47%) and rainy season (32.42%). Among viral diseases, prevalence of PPR was highest 8.52% followed by FMD (6.81%), goat pox (2.68%), contagious ecthyma (1.76%) and rabies (0.25%). The prevalence of peste des petits ruminants (PPR) was highest in winter (15.86%). The prevalence of pneumonia was highest 8.71% in whole year among the bacterial diseases. The prevalence of fungal disease (ringworm) was 1.44% in goat. The prevalence of trematodiasis was 12.60% followed by nematodiasis (11.27%), babesiosis (2.18%), tape worm infection (2.03%) and coccidiosis (1.19%). The prevalence of ecto-parasitic diseases was 12.06% .The prevalence of trematodiasis was highest in rainy season (18.01%). The prevalence of babesiosis was highest in summer (3.81%) and coccidiosis in winter (3.81%). The prevalence of ecto-parasitic diseases was lowest in winter **(**8.88%)**.**

Peter *et al.* (2015) were conducted a study to determine the distribution of diseases of sheep and goats encountered at the State Veterinary Hospital, Maiduguri, between the years 2009 to 2013. A total of 1298 cases were documented during the time period. Diseases occurrence was found to be higher in sheep (89.0%) than in goats (11.0%). The most frequent diseases of sheep were parasitic (34.5%), digestive (15.2%) and surgical conditions (13.2%). Similarly, infectious diseases (24.5%), parasitic diseases (21.7%) and surgical conditions (18.2%) were encountered in goats. Highest and lowest clinical cases were registered in the years 2009 and 2010, respectively. The study showed that the occurrence of diseases is similar in both species. It is recommended that animal owners and health service providers should make available necessary drugs and equipment in advance for the management of these frequent clinical diseases especially

when the peak season for these disease approaches. Furthermore, animals should be immunized for the common diseases of small ruminants on periodical basis.

Rahman *et al.* (2015) reported that a total of 112 diseased goats were examined on which 21 PPR cases (18.75%) were diagnosed on the basis of clinical history. The study revealed that about 0-6 months aged group of goats (46.15%) were more prone to PPR as compare to other aged groups. In addition, Black Bengal (20%) were more susceptible than Jamunapari (17.64%) goats. In case of Black Bengal

Zeru *et al.* (2015) conducted a study and resulted out of 614 goats and 446 sheep examined for ectoparasites, 564 (91.86%) goats and 422 (94.62%) sheep were found infested with one or more ectoparasites. The overall prevalence was 93.02% (986/1060). The overall prevalence of ectoparasite was significantly higher in adult (96.91% in sheep, 93.83% in goat) than young (88.52% in sheep, 86.25% in goat) (P< 0.05). No significant association between the ectoparasite prevalence among the woredas, sex and body condition was evidenced in both species. Higher tick infestation prevalence, 90.75%, were observed both in sheep (90.58%) and goat (90.88%) followed by lice prevalence rate of 6.41% (11.66% in sheep and 2.93% in goat) and mange (*Demodex*) (0% in sheep and 0.65% in goats). Overall eight genera of ectoparasites belonging to ticks (*Boophilus, Amblyomma, Rhepicephalus, Hyalomma*and *haemaphisalis*), lice (sucking and biting lice) and mange (*Demodex)* were identified.

Seyoum *et al.* (2015) was conducted this study to determine the prevalence and type of ectoparasites andthe prevalent ectoparasites observed were lice, ticks, *Ctenocephalides* species, *Melophagus ovinus*, and *Demodex* species.The infestation rates of ectoparasites with age and sex were significantly varied (*P*< 0.05) in sheep but not in goats (*P*> 0.05). Body condition score was not significantly associated (*P*> 0.05) with ectoparasites infestation in both sheep and goats. In our attempt, only two cases due to *Demodex* species were recorded in sheep.

Mahdi *et al.* (2015) were conducted an abattoir study on 21854 sheep, and 3659 goats are slaughtered in Duhok abattoir, from October 2013 to January 2014. The objective was to determine the prevalence of disease conditions affecting the lungs. Routine meat inspection procedures were done to detect the presence of the pathological lesions. A total of 21854 (13%) and 3659 (4.3%) lungs of sheep and goat, respectively, were

examined and the main condemned diseases in this study were recorded as namely pneumonia, and hydatidosis.

Nath *et al.* (2014) found that the prevalence of Peste des Petis of Ruminant (PPR) was highest (11.33%) whereas babesiosis was less common (0.40%). The prevalence of infectious disease was highest in 13-18 month age group (68.00%) and lowest at 19-24 month age group (53.73%). The prevalence of infectious disease was highest at Black Bengal breed (64.23%) and lowest in Jamunapari cross (57.39%). Prevalence of PPR was found highest both for male and female goat. Highest percentage was observed in case of mixed infection (49%) and lowest in case of fungal infection (4%). Occurrence of various infectious diseases was higher in rainy season (36.43%) followed by winter season (34.94%) and summer season (28.62%). Female goat was found to be more susceptible (64.22%) than the male animal (35.77%).

Parvez *et al.* (2014) was conducted to determine the prevalence of clinical diseases and manifestations of goats and set up that among 2778 goats were registered for medicinal cases 74.66%, surgical 16.84% and gynae-obstetrical 8.50% respectively. Among the medicinal cases, highest percentage was recorded with the diseases of digestive system 16.85% followed by parasitic diseases 15.22% and infectious diseases 11.95%.

Soundararajan *et al.* (2014) resulted that the most abundant species found in this study were *Haemaphysalis bispinosa* (100%), *Hyalommamar ginatumisaaci* (7.29%), *Rhipicephalus haemaphysaloides* (3.13%) and *H. anatolicum anatolicum* (2.08%). Among the infested goats, females were heavily infested (78.64%) than the males (51.52%). Among the age groups, the hogget animals were heavily infested (83.87%) followed by adults (71.43%). Among the breeds, non-descript goats were heavily infested (94.29%) followed by Kanni goats (90.91%) and Boer x non-descript cross breeds (51.56%). Ticks were located mostly on the ears (69.79%) than the other parts of the body (30.21%).

Owhoeli *et al.* (2014) revealed that an overall prevalence of (75.5%) was recorded, out of which 57 (76.0%), 55 (70.5%), and 49 (81.6%) were recorded for exotic goat in the months of May–September, 2010, exotic goat in the months October 2010–February, 2011 and for indigenous goats, respectively. The overall prevalence amongst the infected animals was not statistically significant (P>0.05). Species of helminthes revealed fromthe studywere, *Haemonchus*, *Strongyloides*, *Chabertia*, *Trichuris*, *Ostertagia*,

Bunostomum, *Trichostrongyloida*, *Ascaris*, *Tenia*, *Avitelina*, *Fasciola*, *Eurytrema*, *Gastrothylax*, *Schistosoma*, and *Dicrocoelium*.

Moon (2014) conducted this study and nine species of helminths were identified, of them four species were trematodes, namely, *Fasciola gigantica*(6.8%), amphistomes(13.6%), *Schistosoma indicum*(5.7%), and *Schistosomaspindale*(4.6%); four species were nematodes, namely stomach worm (*Haemonchu*s sp.) (6.8%), *Oesophagostomum* spp. (5.7%), *Strongyloides* spp. (11.4%), hook worm (*Bunostomum* sp.) (5.7%). One cestode was detected namely, *Moniezia* sp.(4.6%). In this study it was observed that prevalence of amphistomes (13.6%) was the highest whereas *S. spindale*(4.6%) was the lowest. The EPG (Egg per gram of feces) was determined. In this study, prevalence of helminth infections in relation to age, sex, and nutrition condition of the goats were observed. In age groups, adult≥2 years (43.8%) were more susceptible than that young, 6 month to<2years (27%).In age groups the result was found statistically insignificant. In nutritional condition groups, prevalence was significantly (P<0.01) higher in poor body conditioned goats (63%) than normal body conditioned goats (52.9%). The prevalence of helminth infections was significantly higher in female (53.2%) than in male (46.2%).

Silva *et al.* (2014) were analyzed regarding the occurrence and diversity of *Eimeria* species. Fecal samples obtained from 144 animals (52.1% dairy goats, 47.9% pre-pubertal goats) were examined using the modified McMaster technique to determine the number of oocysts per gram of feces. *Eimeria* spp. oocysts were present in 98.61% of the fecal samples and, overall, nine different *Eimeria* species were identified. The most prevalent species were *E. ninakohlyakimovae* (88%) and *E. arloingi* (85%), followed by *E. alijevi* (63%) and *E. caprovina* (63%). The average number of oocysts shed was significantly lower in dairy goats than in pre-adult animals. Astonishingly, no clinical signs of coccidiosis were observed in any of the animals examined, even though they were shedding high numbers of oocysts and were infected with highly pathogenic species. Thus, implementation of routine diagnostic investigation of the occurrence and diversity of caprine *Eimeria*s pecies may be a useful tool for determination and better understanding of their potential economic impact on goat herds in southern Portugal.

Kheirandish *et al.* (2014) revelead that nine different Eimeria species were identified: *E. arloingi* (68.26 %), *E. christenseni* (50.9 %), *E. ninakohlyakimovae* (41.8 %), *E. caprina*

(31.7 %), E. *alijevi* (29.8 %), *E. jolchijevi* (26.92 %), *E. apsheronica* (22.59 %), *E. hirci* (11.05 %), and *E. pallida* (5.2 %). Goats were considered in three age groups (less than 2 years old, 2–3 years old and over 3 years old). Obtained data indicated that coccidiosis was relatively common among the goats in this area. The highest rate of oocyte counts were observed in goats over 3 years old and females were more affected than male. The sex and age of the goat had not significant effects on the prevalence of coccidiosis, as well. There was no significant difference in oocyte per gram during different months. Coccidial lesions occurred in the jejunum and ileum more than other parts of intestine.

Amin *et al.* (2013) were carried out the study in 35 Black Bengal goats (29 females and 6 males) affected with *Coenurus cerebralis* (Gid disease). The occurrence of Gid disease was more frequent in the females (82.86%) also among females pregnant does were found to be more vulnerable (65.52%). The disease predominantly occurred (51.4%) in the animals between 1-2 years of age. All the affected goats were found to be emaciated and listless. The disease was more common in the rainy season compared to other seasons.

Juyena *et al.* (2013) stated the myiasis affections in ruminants in respect to species age, sex, breed, season and predilection sites and showed that 151 animals were affected with myiasis and maggot wounds predominantly occurred in the cattle (71.6%) among which calves were more affected. Myiasis was very prone to occur in the navel, vulva, leg and ear. During the study period, more affection occurred in animals of below 6 months (41%). The females (66%) were more frequently affected than the males (34%) and cross breed (57%) was more affected compared to local breed (43%).Moreover, infestation frequently observed from March to June (80%).

Aziz *et al.* (2013), were conducted a study with total of 300 goats (72 males and 228 females) were examined. Depending upon the age, these hosts were divided into four groups viz, 3-23 (n=128), 22-44 (n=121), 45-65 (n=40) and 66-86 (n=11) months. Out of 300 hosts examined 84 were found infested with *S. scabiei var. caprae* showing an overall prevalence of 28%. The prevalence of *S. scabiei var caprae*in female hosts was 30.26% versus 20.83% in males, the difference was statistically significant ($P<0.05$). The prevalence was highest (54.54%) in age group of 66-86 months and lowest (21.09%) in age groups of 3-23 months. The difference was statistically significant ($P<0.05$). Among the three breeds (Nachi, Teddy and Beetle), the highest prevalence (35.48%) was

recorded in Nachi while the lowest prevalence (21.55%) was recorded in Teddy. The difference was statistically significant (P>0.05). In conclusion the sex and breed of host had significant effect on the prevalence of *S. scabiei var caprae*.

Ijaz *et al.* (2013) designed on the prevalence of babesiosis in sheep and goat in Lahore and its peri-urban areas was investigated and the efficacy of three different treatments was measured. A total of 620 blood samples (n=243 sheep; n=377 goats) were collected and examined microscopically. *Babesia* infection was found in 57(23.46%) sheep and 51(13.53%) goats. Haemoglobin (Hb), packed cell volume (PCV), red blood cells (RBCs) and thrombocytes were found to be significantly decreased ($P<0.05$) while there was no effect on other blood parameters.

Rahman *et al.* (2012) investigated on a total of 448 goats and founded the highest cases was recorded with digestive disorders (22.9%), followed by parasitic diseases (20.4%) and respiratory disorders (16.8%). Other Medicinal cases in goats were eye diseases (13.5%), infectious diseases (11.8%), general systemic states (9.6%), musculo-skeletal disorder (3.3%), skin diseases (0.8%) and nutritional deficiency diseases (0.8%).

Bhuiya (2012) stated that among twenty eight (28) outbreaks of PPR were investigated where the overall morbidity and mortality were 74.92% (63% to 100%) and 58.71% (23%-100%), respectively. Mortality was higher in the young goat (<1 year).

Kashem *et al.* (2011) was carried out a study on a total of 168 female goats and 9 bucks were recorded from two types of households of which 125 goats were infected (74.70%) by a number of diseases and lead to mortality (17.26%). Survival rates and mortality percentage of kids were 80.60 and 19.40, respectively but the highest mortality was in Habiganj (21.18%). Seasons had special influences on mortality of adult goats (35.81%) and kids (64.19%) where the highest mortality rates were 22.22% and 25.93%, respectively in rainy season. PPR had the highest mortality rates (37.93% in adults and 25.00% in kids) followed by pneumonia (24.14% and 21.15%, respectively). Predator invasion was the other remarkable cause for increased kids' mortality (23.08%). The study suggests that hygienic management practices, adequate supply of nutrients, and vaccination and deworming programmes in semi-intensive rearing system of BBGs at rural level will improve the survival rates of adult goats and kids

Ali *et al.* (2011) The commonly found various diseases were worm infestation (51.5%), pneumonia and pneumonitis (7.9%), ephemeral fever (3.7%), enteritis (3.4%), mastitis(3.2%), mange (3.2%), indigestion (2.8%), anestrous(2.6%). Rest of the diseases had lower percentage than 2%. Out of 3988 sick animals, 74.7% were female and 25.3 % were male animals. Animals aged between 2-5 (A1) years had high prevalence (54.0%) and it was low in age group 8-10 years (A4), 2.4%. Prevalence of diseases was high (42.3%) in rainy season (June-October) followed by (32.5%) in winter (November-February) and lowest (25.2%) in summer season (March-May). Gastrointestinal diseases 61.6 % (2458 cases) was seen highly prevalent among all groups of animals which was followed by infectious diseases 10.4% (416 cases), skin diseases 9.4 % (377 cases), respiratory diseases 8.27% (330 cases) and reproductive diseases 7.93% (cases).

Noman *et al.* (2011) recorded from 1086 cases, male and female goats were accounted as 46.72% and 46.87% due to PPR, 20.56% and 15.63% due to pneumonia, 14.02% and 20.83% due to diarrhoea, 6.54% and 5.2% due to coccidiosis respectively, indicating a significantly lower treatment figure for PPR ($p<0.05$). The mortality rate of the growing kids in season-I (March to June), season-II (July to October), season-III (November to February) were 14.7%, 40.6% and 19.4%. PPR and bronchopneumonia were found higher in season-III than other seasons whereas diarrhoea in season-I and coccidiosis in season-II were higher.

Rahman *et al.* (2011) Peste des petits ruminants (PPR), an economically important morbilli virus infection of sheep and goats, is widely distributed in sub-Saharan Africa, Middle East and western and southern Asia including Bangladesh. A small flock of Black Bengal goats contracted PPR following introduction of new animals. A pathological investigation was conducted on the outbreak, the viral RNA corresponding to F gene was detected by RT-PCR and the virus was isolated in Vero cells. Out of 37 goats 19 (51 %) developed clinical disease, of which 5 (13.5 %) died. Goats under one year of age had highest morbidity and mortality with typical signs and lesions of PPR.

Aguiar *et al.* (2011) reported that 17.99% (52/289) in goats were affected in foot rot.

Hassan *et al.* (2011) reported that the overall prevalence of gastrointestinal helminths in goat were 63.41% (N=317). In these positive samples, *Strongyloides* spp. (51.74%) was more prevalent and *Moniezia* sp. and *Capillaria* sp. were least prevalent (n=201). The gastrointestinal parasitic load of goats varied from egg per gram (epg) 0 to 1600. Faecal

sample evaluation shows, 36.95% and 13.56% goats were loaded epg 0 and 300, respectively. Age was evident as risk factor where older goats (> 24 month) were more infected by endoparasites than younger ones (< 24 month) in this study ($p < 0.05$).

Asghar *et al.* (2011) found that the total rate of infection by different species of mites in the examined animals reached to 63 (2.8 %). Scabies infection reached to 5.6% and 6.5% in native sheep and goats, respectively. In the same time no scabies infection could be diagnosed in the imported sheep. *Sarcoptic scabiei* is the most common identified mite species. It had been diagnosed from 34 (54 %), 10(15.9 %) and 12 (19 %) of examined nostril, ear and nostril and ear of all infested animals, respectively. *Psoroptic communis ovis* and *Psorergates ovis* mites were extracted from 7.9 % of the examined back lesions, while *Psoroptic communis ovis* only were extracted from 3.2 % of the tail lesions of the affected animals.

Islam *et al.* (2011) were conducted a cross sectional study which undertaken on 242 lactating does during January to August 2009. Data on probable risk factors was recorded by using questionnaire. Clinical mastitis was detected by gross signs of udder infection during physical examination and abnormal milk whereas subclinical mastitis was recognized California Mastitis test (CMT). Milk samples of all clinical and subclinical mastitis goats were subjected to culture for isolation and identification of responsible bacterial pathogens. Multiple logistic regression model using a backward stepwise method was used for identification of risk factors. The overall prevalence of clinical mastitis and subclinical mastitis were 4.54% and 37.19%, respectively. Bacterial pathogens isolated were coagulase negative Staphylococcus (73.73%), Staphylococcus aureus (26.67%), Streptococcus sp. (20%), Bacillus sp. (70%) and Escherichia coli (6.67%). Both clinical and subclinical mastitis were significantly associated with age ($p<0.001$), parity ($p<0.001$), lactation stage ($p<0.001$), litter size ($p<0.05$) and teat lesions ($p<0.001$).

Rony *et al.* (2010) conducted this study to determine the prevalence of ectoparasitic infestation in goat. Among 165 Black Bengal goats examined, 114 (69.09%) were found to be infested with several species of ticks, lice and flea. The prevalence rate was highest in *Boophilus microplus* (45.45%) followed by *Rhipicephalus sanguineus* (31.51%), *Linognathus vituli* (25.45%), *Heamaphysalis bispioa* (20%), *Haematopinus eurysternus* (15.75%), *Damalinia caprae* (8.48%)

and *Ctenocephalides canis* (4.84%). In this study, prevalence of ectoparasitic infestation in relation to age, sex, nutritional condition and rearing systems of animals and seasons of the year, were also observed. Young goats aged ≤ 6 months (75.86%) were more susceptible than adults aged > 6-24 months (65.51%) and older goats > 24 months (59.32%). In female, prevalence was recorded significantly ($p < 0.05$) higher than male. Animal with poor health was found to be significantly more vulnerable to such parasitic infestation than normal healthy animals. Prevalence of ectoparasites was significantly ($p<0.05$) higher in animals, reared under free-range system than that of semi-intensive system. Prevalence was highest ($p<0.05$) in the summer (81.35%) followed by winter (62.96%) and rainy season (59.26%).

Talukder *et al.* (2010) were conducted in Sylhet district of Bangladesh to investigate the pathological effect of liver fluke in Black Bengal goats of different age groups, sex and in seasons. In this study, livers of male and female goats were collected randomly from slaughter house during a period of 1 (one) year (November, 2007 to October, 2008). A total of 325 Black Bengal goat livers were examined, of which 70 livers were found infected with *Fasciola gigantica.* The common histopathological changes found in this study were the migratory tract with lymphocytic infiltration, atrophy, necrosis and fatty changes in the liver. The study revealed that age of the animal has significant effect on Fascioliasis in goats. Significantly ($P<0.01$) highest infection rate was found in 2-2.5 years old animals (50%). The sex of the animal was also found as important determinants for Fascioliasis. In this study out of 219 male goat livers 30 (13.70%) were infected with Fasciola. On the other hand, out of 106 female goat livers, 40 (37.73%) were found positive with Fascioliasis.

Arafa and Fouad (2008) recorded that Out of 350 faecal samples of goats were examined, 321 animals proved to be infected with different internal parasites, representing an incidence rate of 91.7%. The total infection rate of Eimeria was 88.9% and the total infection rate of different helminthes was 25.4%. Infection rate in kids was 97.4% and in adults was 87.3%. The infection rate of the nematode worms was 22.0%, Trichostrongylus sp. showed high rate of infection (6.3%) while Capillaria sp. was the lowest one (0.3%). Moniezia sp. eggs were detected in 2.9% of examined goats. Trematode infection represented as Fasciola and Paramphestomum eggs were detected in 3.4% and 0.9% respectively. . Study the effect of seasonal variation clear that the

highest infection rate of Eimeria was detected in summer season (93.8%) while the highest infection rate of most helminthes was detected in spring and winter seasons.

Al-Qudah *et al.* (2008) were examined during the period between January 2003 and May 2006, 1432 carcasses of slaughtered goats for the presence of any pathological condition and their incidence. The most prevalent problems were gastrointestinal parasitism (45%), caseous lymphadenitis (19%), *Oestru sovis* (8.1%), liver abscesses (19%), hydatid cysts (11%), mange due to *Sarcoptes* sp. and *Psoroptes* sp. (28.5%) and accumulation of plastic foreign bodies in the rumen (14.8%).

Rahman *et al.* (2008) were examined genitalia from 51 female goats (C*apra hircus*) after slaughter at an abattoir in Mymensingh and the frequency of abnormalities determined. Uterine abnormalities were found in 18 (35.2%) cases and uterine infection in 14 (27%). A total of six (11.8%) ovaries showed pathological lesions including three granulosa-cell tumours, two cystic ovarian degenerations, one oöphoritis and one adenomyosis. Remaining conditions included two parovarian cysts, two cervicitis, two salpingitis, and three others. Further study with detailed histopathology is recommended.

Onive *et al.* (2006) were observed Myiasis due to larval stages of the sheep bot fly, *Oestrus ovis* Linnaeus (Diptera: Oestridae) in 72 (62.07%) out of 116 sheep heads examined between September 2003 and February 2004 in Zaria, Nigeria. Prevalence of infestation in rams (66.67%) was higher than in ewes (60.47%) but insignificantly. Monthly prevalence of oestrosis fluctuated between 44% in September and January and 88% in October. Intensity of infestation was highest (26.83 larvae per head) in February and least (2.29 larvae per head) in October. The number of sheep positive for the condition and belonging to each of five age categories (<15 months, 15-22 months, 22-28 months, 28-36 months, > 36 months) did not differ significantly.

Ershaduzzaman *et al*. (2007) were carried out the research work from July 2004 to June 2005 and the place of research work was Bangladesh Livestock Research Institute (BLRI).

Adult goats (>1 yr of age) died mostly due to suspected enterotoxaemia in the dry season (October to March) when there were shortages of green grasses in the grazing lands and female goats died significantly more than male. Growing goats (3- 12 months of age) mortality was about 22%, died mostly due to diarrhoea and pneumonia and mortality was

higher (nearly 40%) in hot and wet season (July to October). The overall kid (0-3 months of age) mortality within study period was about 29%, of which the major causes were infectious (63%) i.e., diarrhoea, pneumonia, ecthyma and enterotoxaemia. Excluding accidental causes (predators and mechanical) mortality was reduced to about 18%.Kid mortality was affected by birth weight which was just opposite to mortality.

Mohanta *et al.* (2007) were studied the prevalence, population dynamics and pathological effects of intestinal helminths in Black Bengal goats, of which 94.67% goats were infected with one or more species of helminths. A total of 5 species of helminth parasites were identified such as *Oesophagostomum columbianum* (92%), *Trchuris ovis* (56.66%), *Schistosoma indicum* (38%), *Moniezia expansa* (10.66%) and *Moniezia benedeni* (2.66%). Single infection was observed in case of *O. columbianum*(16%) and *S. indicum* (2.66%). Single sex infection was established by *S. indicum*male (5.33%). Overall mean parasitic burden was 34.02±2.20. Mean parasitic burden was the highest in case of *O. columbianum* (29.91±2.00) followed by that of *T. ovis*(5.70±0.47), *S. indicum* (4.66±0.42), *M. expansa* (2.59±0.54) and *M. benedeni* (1.00±00). Prevalence of intestinal helminth was significantly ($P<0.05$) higher in winter (100%) than that in summer (89.33%). Calculated odds ratio in between winter and summer was 18, which indicated that Black Bengal goats were 18 times more susceptible to helminth infection in winter. Parasitic burden was also higher in winter (41.53±3.15) than that in summer (25.52±2.57) season.

2.2. Clinical signs

Rahman *et al.* (2015) were found the common findings of high fever, nasal and ocular discharge, rapid and labored breathing, mouth lesion and diarrhea during clinical examination of PPR patients.

Marimuthu *et al.* (2015) said that the animal infested with Sarcoptes and Psoroptes mite was alert and all the vital parameters within the normal range with a body condition score of 2.5/5. Mucous membranes of the mouth and eyelid were pink with capillary refill time (CRT) of less than 2 seconds. All other systems were normal except the integumentary system which showed some pruritic, crusty and alopecic skin lesions with

dried scabs at the ventral neck region, peri-ocular, bilateral external ear pinnae, muzzle region, withers and rump regions

Krishna *et al.* (2015) were found in the case series four cases of hydatid cyst occurring at the lung and liver sites are discussed. The symptoms and signs may be caused by a toxic reaction to the parasite or by local and mechanical effects, depending on the location and nature of the cysts and the presence of complications. Early diagnosis and proper treatment will help to reduce the complication rate and prevent recurrence.

Chakraborty *et al.* (2014) Irrespective of etiology, infectious respiratory diseases of sheep and goats contribute to 5.6 percent of the total diseases of small ruminants. These infectious respiratory disorders are divided into two groups: the diseases of upper respiratory tract, namely, nasal myiasis and enzootic nasal tumors, and diseases of lower respiratory tract, namely, peste des petits ruminants (PPR), parainfluenza, Pasteurellosis, Ovine progressive pneumonia, mycoplasmosis, caprine arthritis encephalitis virus, caseous lymphadenitis, verminous pneumonia, and many others. Depending upon aetiology, many of them are acute and fatal in nature. Early, rapid, and specific diagnosis of such diseases holds great importance to reduce the losses.

Silva *et al.* (2014) said that, no clinical signs of coccidiosis were observed in any of the animals examined, even though they were shedding high numbers of oocysts and were infected with highly pathogenic species.

Prasanna *et al.* (2014) designed that respiratory diseases complicated by multiple bacterial and viral infections are common in goats. At many instances these lead to death of affected ones in untreated cases. Occasionally sudden death can also be caused by faulty drenching and subsequent aspiration of irritant chemicals and development of pneumonia. Moneziasis is a recurrent problem in management of Malabari goats. Aspiration pneumonia develops when vomitus or regurgitus enters the trachea and bronchioles and end up in pneumonia. Acute cases of pneumonia in goats are rarely diagnosed as aspiration pneumonia as the pathological lesions are rarely studied.

Ghebremariam *et al.* (2014) were indicated that among the parasitic diseases encountered in the slaughtered animals, hydatid cysts were the most prevalent ones. This study has depicted that the major contributor for liver condemnation was hydatidosis.

Moreover, the study has shown that the trend of the prevalence of hydatidosis is increasing and this warrants immediate intervention for its control.

Abdullah *et al.* (2014) A two year old Australian Feral male goat weighing 30 kg was presented to the large animal unit of Universiti Putra Malaysia Veterinary Hospital with the clinical signs of conjunctivitis and corneal ulceration with purulent ocular discharge. A sterile swab was taken from the eye for bacteriological culture and the culture yielded a mixed growth of Pseudomonas aeroginosa and Moraxella caprae.The condition was diagnosed as pink eye disease.

Kalaiselvi *et al.* (2014) found the clinical signs of complete alopecia, frequent itching with thick and scaly skin. Dermatophytes are cited among the most frequent causes of dermatological problems in domestic animals.

Kgotlele *et al.* (2013) observed the clinical signs in goats suspected with PPR included fever, dullness, diarrhea, lacrimation, matting of eye lids, purulent oculonasal discharges, cutaneous nodules, erosions on the soft palate and gums and labored breathing.

Kinley *et al.* (2013) presented the CE with a continuum of lesions from hemorrhagic papules, vesicles, and pustules, to multifocal necrotic scabs at the commissure of the lips, medial canthus of the left eye, and distal prepuce.

Onoja *et al.* (2013) characterized by fever (40-42^{0}C) which may be sudden in onset the animals become listless, anorexic, anaemic and jaundice, moderate to high morbidity and mortality has been observed.

Zangana and Aziz (2012) Exhibited acute clinical signs of schistosomiasis in sheep included emaciation, sunken eye, pale mucus membrane and diarrhea. The Infections was more prevalent in age 1-3 years 15.9%.

Giadinis *et al.* (2011) Signed out by the pruritic skin disease lead to progressively to high mortality and dramatic drop of milk yield. The lesions of the affected goats were typical of a chronic and generalized-diffuse sarcoptic mange.

Iqbal *et al.* (2011) Foot rot is a highly contagious and economically important disease of the feet of ruminants especially sheep and goats and is characterized by the separation of keratinous hoof from the underlying epidermal tissue resulting in severe lameness, loss of body condition and reduced wool production.

Housawi *et al.* (2008) mentioned the lesions of mastitis were erythema, papules, pustules and firm irregular scabs on the skin of the udders. One goat developed unilateral moderate udder fibrosis and two of the sheep developed bilateral similar lesions.

Mohanta *et al.* (2007) were observed pathological lesions in case of *O. columbianum*, *T. ovis* and *S. indicum* infection. In *O. columbianum* infection, hard, raised, slightly yellowish to greenish colored nodules measuring 0.25×0.50 cm were observed. But moderate infection with *T. ovis* was characterized by catarrhal inflammation along with the petechial haemorrhage on the intestinal mucosa where parasites were firmly attached. In case of *S. indicum* infection, haemorrhages were observed particularly on the rectal mucosa. Numerous eggs were found in the mucosal scraping from intestinal surface.

North (2004) mentioned that the Infestation with lice results in considerable damage tothe skin or fleece because infected animals bite and scratch and rub against fences, trees and other objects. Biting lice feed on skin and scurf. Sucking lice cause more severe damage as they puncture the skin and suck blood and tissue fluids. Raw and scabby areas may develop on the skin. Heavy infestations with sucking lice can result in anaemia. The goat is left in a ragged appearance, with dull coat and loss of body condition. There is often a characteristic odor, especially in humid weather.

Ribeiro *et al.* (2007) Gangrenous mastitis in goats is a severe clinical condition of the inflammatory process in mammary glands. Clinical signs commonly occur in the first weeks of lactation, committing one or two sides of the glands and are characterized by fever, anorexia, dyspnoea and systemic signs of toxemia. Initially, the udder was hot, painful and occur swelling of the affected side, with milk watery, containing flocculent pus and/or blood secretion. Evolution of the process is characterized by udder becoming discolored (blue–blackish or blue–greenish), cold, with demarcation line of the affected tissue, development of abscess and draining pus. Fatal clinical course is characterized by worse of corporal condition, pneumonia, septicemia and/or toxemia

Kumar *et al.* (2001) studied an outbreak of PPR and appeared anorexia, fever, diarrhea, nasal discharge and pneumonia were the constant features of the disease but buccal lesions, conjunctivitis and corneal opacity were observed only in few cases

2.3. Gross lesions

Oludunsin *et al.* (2015) revealed the gross lesions of mastitis were generalized wrinkling and thickening of the skin with heavy crust formation on the abdomen, forehead, ear, the limbs, inter-digital spaces, mammary gland and inner thigh.

Okoye *et al.* (2015) founded macroscopically, some of the infected livers appeared to be slightly swollen with pale color at the round edges, while some appeared greatly swollen, with a few small irregular whitish areas indicating fibrosis over the parietal surface. In some cases, the capsule was thick and rough with whitish or reddish discoloration and parenchyma was hard due to fibrous tissue. Fibrosis of the bile ducts with numerous small and large patches scattered over the parietal surface and the pipe stem appearance of the liver were noticed.

Chowdhury *et al.* (2014) founded that he major gross lesions of PPR were congestion of gastrointestinal tract, pneumonia, engorged spleen, and oedematous lymphnodes.

Abraham and Jude (2014) were investigated that the fasciola parasite intensity ranged between 8 - 10 flukes per liver of infected cattle and 4 - 5 flukes per liver of infected goat. Infected liver of the two ruminants were damaged. Damaged Hepatic parenchyma resulting in severe haemorrhage, thickening and gross fibrosis of bile duct were observed.

Kgotlele *et al.* (2013) founded on post mortem findings of ppr included pneumonia, congestion of the intestines, and hemorrhages in lymph nodes associated with the respiratory and gastrointestinal systems.

Gashaw and Mersha (2013) founded the predominant gross pathologic lesions of foot rot were crusts and scabs, which mostly occurred because of either degeneration or traumatization as a consequence of earlier primary lesions.

Thakuria *et al.* (2013) founded grossly in scabies, severe skin lesions all over body forming crusts on face, forehead, ears, shoulders, back, flanks, inner aspects of thighs, hind legs and inguinal region as well as skin scrapings.

Tafti *et al.* (2012) founded in myiasis, macroscopically founded variable numbers of different larval stages (first, second and third) were observed in the subcutaneous tissues and the skin of the back and flanks. Abscess formation, perforated ulcers and also a number of holes due to migratory tracts and emerging mature larvae were observed in

the affected skins. No larvae or any suspected lesions were found in other parts of the body.

Blutke *et al.* (2010) conducted the necropsy and revealed 2 thick-walled hydatid cysts, each 7–8 cm in diameter in the lung. The tri-layered cyst walls consisted of an outer adventitial layer, a laminated acellular intermediate layer, and an inner germinal membrane. Grossly, the cysts contained a clear, amber liquid with hydatid sand.

Mohanta *et al.* (2007) Pathological lesions were observed in case of *O. columbianum, T. ovis* and *S. indicum* infection. In *O. columbianum* infection, hard, raised, slightly yellowish to greenish colored nodules measuring 0.25×0.50 cm were observed. Microscopically, it was characterized by catarrhal inflammation associated with destruction and desquamation of epithelial cells. Affected tissues were infiltrated chiefly with lymphocytes, macrophages, a few eosinophils and occasionally with plasma cells and neutrophils. Caseation and fibrous tissue proliferation were also noticed. But moderate infection with *T. ovis* was characterized by catarrhal inflammation along with the petechial haemorrhages on the intestinal mucosa where parasites were firmly attached. Histopathologically, it was characterized by destruction of lining epithelium of villi of caecum and colon along with the cellular infiltration predominantly with lymphocytes, few eosinophils and occasionally by macrophages. Lymph nodes of the lamina propria were enlarged. In case of *S. indicum* infection, haemorrhages were observed particularly on the rectal mucosa. Numerous eggs were found in the mucosal scraping from intestinal surface.

Kumar *et al.* (2001) founded on necropsy findings of PPR consisted of necrotic and ulcerative lesions on lips, gums, buccal mucosa, pharynx, oesophagus and nasal mucosa. Larynx, trachea and bronchi showed congestion and pulmonary parenchyma revealed consolidation and emphysema, erosive and haemorrhagic abomasitis and enteritis, enlargement of spleen and Iymphnodes were mainly observed

Perrucci *et al.* (1996) result that parasitic otitis associated with *Psoroptes* sp. mites was diagnosed for the first time in two flocks of goats located in Tuscany, Italy. Some animals presented clinical signs of ear mite infection, but the parasites were also isolated from the ears of two clinically silent goats. A morphometric study was conducted to establish whether there are significant morphological differences between mites collected from the ears of goats and *Psoroptes cuniculi* collected from the ears of rabbits. Three

rabbits were experimentally infected with mites isolated from the auditory canal of goats, while nine goats were infected with mites isolated from rabbits. After three to five months all rabbits and five of the nine goats contained reproducing mite populations in their ears; also the morphometric analysis revealed no difference between rabbit and goat ear mites. It follows that *Psoroptes cuniculi* represents the etiologic agent of parasitic otitis in both these two animal species.

2.4. Microscopic Lesions

Okoye *et al.* (2015) concluded the histopathological changes in the livers of cattle infected with *Fasciola gigantica* reflected tissue damage.

Abraham and Jude (2014) were detected the dislodge hepatic cells became wandering cells amidst macrophages within the sinusoid. The central vein of cattle infected by *Fasciola hepatica* and *Fasciola gigantica* was enlarged and laden with debris resulting in obstruction of liver function such as protein synthesis. This caused the liver to be rejected.

Habtamu *et al.* (2013) conducted an investigation on schistosomiasis and microscopic evaluation of H and E stained sections of liver, intestine and mesenteric lymph nodes revealed granulomatous inflammation characterized by aggregates of mononuclear cells around the eggs. Van Gieson's staining also showed excess collagen deposition in the liver. The mesenteric veins revealed marked medial hypertrophy

Borai *et al.* (2013) founded the lesions in acute fascioliasis were severe congestion, hemorrhagic migrating tracts formed from degenerated hepatocytes, erythrocytes and eosinophils beside old parasitic tracts represented by central necrosis surrounded with eosinophils, macrophages and lymphocytes together with connective tissue capsule. Chronic fascioliasis characterized by presence of liver flukes within the lumen of the bile ducts in addition to dystrophic calcification in case of cattle, buffaloes and camels but it was not noticed in sheep. Hydatidosis and cysticercosis were characterized by typical cyst formation which may be fertile, sterile, degenerated or calcified.

Se´adawy *et al.* (2012) collected 3 samples of fertile hydatid cysts and 3 other sterile were collected from sheep liver and 3 samples of sterile hydatid cysts from cows liver and measured dimentions of cysts and calculated quantity of hydatid fluid and viability of protoscolices by staining with eosin stain then examining under light microscope of

40x. Petechial hemorrhage and paleness around cysts were important gross lesions in sheep in addition to calcification in cow hydatid cysts, on other hand the histological lesions were thickened fibrous layer and sever necrosis with infiltrations of eosinophils and extensive calcification in cow's liver. There was significant effect of amount of hydatid cyst, thickness of fibrous layer and thickness of necrotic layer.

Nonga *et al*. (2010) found areas of hemorrhagic tracts caused by the migrating flukes which were infiltrated by eosinophils. Some of the bile ducts showed hyperplasia & increased secretory activities. In many areas cirrhosis accompanied by pressure atrophy, fatty change &necrosis of parenchymatous cells were reported. Depositon of hemosiderin and in some cases nodules of mononuclear cells were also observed. They also observed that *Fasciola hepatica* caused dilatation of the bile ducts in the left lobe of the liver of the sheep and thickening of the in walls, but similar lesions were rarely found in the right lobe of the liver. A brownish exudates & a number of mature *Fasciola hepatica* were found in lumen.

Blutke *et al.* (2010) founded under light microscopy of the hydatid sand revealed free protoscoleces, intact and ruptured brood capsules, calcareous corpuscles, and debris

Badr *et al.*(2009) were detected in the histopathological examination of acute hepatitis revealed hepatic necrosis and degeneration with presence of multiple variable sized abscesses in the hepatic parenchyma consisted of homogenous structure less mass of necrotic cells surrounded by heavy aggregations of inflammatory cells mainly neutrophils, histiocytes and lymphocytes, and the abscesses bounded by fibrous connective tissue capsule. While the chronic hepatitis revealed increased fibrous connective tissue proliferation in the portal triads, around small and large bile ducts and in the Glisson;s capsule. The biliary epithelium were hyperplastic with formation of large numbers of newly formed bile ductules and presence of mature fasciola worm within the lumen of the main bile ducts.

Kardman (2004) mentioned the main histopathological findings in the livers of infected animals were granuloma formation and hepatocelular swelling and vacuolation. Ova granuloma were also noticed in the lung, lymph node and intestine. Glomerulo-inertial nephritis was observed in the kidneys. Haemosiderin pigment was deposited in the spleen. In the heart, myocarditis was observed.

Seed and Nelson (1974) studied the experimental schistosomiasis in sheep, where they observed more pronounced advancement of disease near its inferior margin of the left lobe, while the rest of the organ was normal. Dark irregular infarcts due to verminous thrombosis in the portal vessels and the formation of multiple whitish nodules 1-2 mm in diameter.

Hussain (1971) observed that the cut surface of the liver showed a slight or moderate thickening of the portal tracts & the capsule overlying the affected parts showed a slight thickening. Histologically, severe tissue reaction characterized by diffuse inflammatory cell infiltration of the portal tracts, parasitic thrombi, granulomas surrounding the eggs, eosinophilic abscesses were seen around recently dead scistosomes in the liver parenchyma. Granulomas or pseudotubercles around eggs were not a couspicuous feature.

Aroora and Iyer (1968) studied on the pathology of the ovine & caprine livers owing to the *Schistosoma spp.* infection revealed that the liver had a nodular appearance, in schistosomiasis, resembling nodular cirrhosis. Histologically, the lesions appeared as psudotubercles, chronic changes in the biliary triads and or scattered necrotic foci in the parenchyma. Radiating club like structures resembling. Hoeppli bodies surrounding the eggs and the presence of cross sections of the parasites within the necrotic foci were additional features.

CHAPTER III

MATERIALS AND METHODS

3.1. Study area and time

The study was carried out in the Department of Pathology and Parasitology under the Faculty of Veterinary and Animal Science (VAS) of Hajee Mohammad Danesh Science and Technology University, Dinajpur (HSTU), the data were collected from patient register of Upazilla Veterinary Hospital (UVH) and District Veterinary Hospital (DVH), Sadar, Dinajpur maintained by veterinary surgeon during the period of July, 2014 to June, 2015. The data were analyzed retrospectively and interpreted to determine the prevalence of diseases, seasonal pattern and distribution of diseases. The breed, age and sex of the goats were collected from the register.

3.2. Sampling and data processing

During this study period a total of 2,139 goats (1269 form UVH and 870 from DVH) were recorded to visit both of these hospitals from which prevalence of infectious diseases were made. Among them, the Jamunapari (1179) was the dominant breed followed by BBG (960), the numbers of male and female were 978 and 1161. Examined goats were categorized into 3groups related with age like Group-1 (0-12 months), Group-2 (13-24 months) and Group-3 (>24months) and the number of goat in rainy seasons (July-October), winter (November-February) and summer (March-June) were 703, 717 and 719 respectively. The data were checked manually for obvious inconsistencies, recording errors or missing data. The potential errors were evaluated and corrected. Data with suspicious values were excluded. Data were statistically analyzed by Statistical Package for Social Science (SPSS) software 17.0 version. T-test and Chi-square test were used to know the association between different groups in respective cases.

3.3. Diagnosis of diseases

According the virtue of the individual case, the diseases were diagnosed on basis of owner's statement, clinical signs, general clinical examinations, laboratory diagnosis with necropsy and microscopic examination.

3.3.1. Owner's statement

Information of goats was recorded according to age, sex, breed, months and seasons were also recorded by carefully asking questions to the owner or farmers.

3.3.2. Clinical signs

Goat diseases were diagnosed on basis of clinical signs as described by Samad (2001), Kahn (2000) and Jones et al. (1998).

3.3.3. General clinical examination

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.

The individual goat was observed as unobtrusively as possible respiratory rate and character was assessed before restraint, temperature and pulse (from the femoral artery) was taken immediately after the animal was restrained. The mucous membrane colour was assessed in the conjunctival or vulval mucosa. Skin thickness and mobility was checked and any variation in

temperature noted for evidence of local inflammation. Lymph node enlargement was palpated. The two sides of the head were compared to see if there was any disparity between them. The animal was examined for identifying difficulty of breathing, coughing and other signs of respiratory distress as per methods described by Jackson and Cockcroft (2002).

Gross examination of faeces was made for the detection of living or dead worms or for the detection of the segments of tapeworms. The animal body was examined by partitioning of hair for the presence of any visible ectoparasites. Ectoparasites were identified according to the keys and descriptions given by Wall & Shearer (1997).

3.3.4. Laboratory diagnosis

Parasites were identified according to the keys given by Rahman *et al*. (1996) and Soulsby (1986). Blood smears were prepared and examined under microscope after Giemsa's staining according to the methods described elsewhere to confirm hemoprotozoan infestation (Hendrix and Robinson, 2006).

3.3.5. Pathological examination

3.3.5.1. Gross pathology

The pathological study was carried out in the Department of Pathology and parasitology, Faculty of Veterinary and Animal Science, Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur. The postmortem examination in some cases was performed as soon as the dead goats were collected and in maximum cases, the samples were collected as per objectives from nearby slaughter house at sadar, dinajpur. The samples were collected with sterile instruments and transferred in the laboratory. At necropsy, gross tissue changes were observed and recorded carefully. The representative tissue samples containing lesions were fixed in 10% formalin for histopathological studies.

Equipment and appliances for necropsy:

- Goat (Liver, lung, Spleen and Intestine)
- Scissors
- Forceps

- Gloves
- Musk
- Scalpel
- Knife
- A pair of shears
- 10% formalin

3.3.5.2. Histopathological study

During necropsy, various organs having gross lesions were collected, preserved at 10% formalin, processed, sectioned and stained for histopathological studies following a standard procedure (Luna, 1968).

Equipment and appliances for histopathology:

- Samples (Liver, lung, Spleen and Intestine)
- 10% formalin
- Chloroform
- Paraffin
- Alcohol
- Tape water
- Xylene
- Hematoxylin and Eosin stain
- Distilled water
- Clean slides
- Cover slips
- Mounting media (DPX)

- Microscope

Cleaning & sterilization of required glassware

Test tubes, glass tubes, glass slides, cover slips, beakers, pipettes, reagent bottles, glass bottle, spirit lamp, measuring cylinders etc. were used in this study. The conical flask, measuring cylinder, beakers, glass slides, cover slip, for slide preparation for histopathological study and staining of organisms after smear and pipettes, reagent bottle, glass tubes for different biochemical tests. New and previously used glassware were collected and dipped in 2% sodium hypochlorite solution and left there until cleaned. After overnight soaking in a household dishwashing detergent solution, the glassware were cleaned by brushing and washed thoroughly in running tap water and rinsed three times in distilled water. The cleaned glass wares were then dried on a bench at room temperature or in an oven at 50-70^{0}C.

Tissue processing

1. Collection of Tissue: During tissue collection, the following points were taken into consideration-

- The tissues were collected in condition as fresh as possible.
- Normal and diseased tissues were collected side by side.
- The thickness of the tissue were as less as possible (5-7 µm approximately).

The following tissues were collected from the suspected goats with internal parasitic infection in the Histopathology Laboratory of Department of Pathology and Parasitology, HSTU, Dinajpur, for histopathological examination.

- Liver
- Lungs
- Spleen
- Intestine etc.

2. Fixation: Fixative (10% Formalin) was added by 10 folds of the tissue size and weight. It is important to consider that a fixative should not be too toxic to its handler, and it should not damage the tissue being preserved.

3. Washing: The tissues were trimmed into a thin section and washed over night in running tape water to remove formalin

4. Dehydration: Dehydration by ascending ethanol series to prevent shrinkage of cells as per following schedule-

- 50% alcohol- 1 hour
- 70% alcohol- 1 hour
- 80% alcohol- 1 hour
- 95% alcohol- 1 hour

5. Cleaning: Cleaning by chloroform for 3 hours to remove ethanol (1 and half hour in each of 2 chloroform jar)

6. Impregnation: Impregnation was done in malted paraffin (56-60^{o}C) for 3 hours.

7. Embedding: Paraffin blocks containing tissue pieces were made using templates and malted paraffin.

8. Sectioning: Then the tissues were sectioned with a microtome at 5-6µm thickness. The section were allowed to spread on luke warm water bath (40-45^{o}C) and taken on a glass slide. A small amount of gelatin was added to water bath for better adhesion of the section to the slide. The slides containing section were air dried and stored in cool place until staining.

Routine Hematoxylin and Eosin staining

1. Preparation of Ehrlich's Hematoxylin solution

- Hematoxylin crystal 4.0gm
- Alcohol, 95% 200ml
- Ammonium or potassium alum 6gm
- Distilled water 200ml
- Glycerine 200ml
- Glacial acetic acid 20ml

Hematoxylin is dissolved in the alcohol and the alum is dissolve in distilled water and mixed thoroughly. After these are in complete solution the glycerin and acetic acid are added.

2. Preparation of eosin solution

- Eosin Y, water soluble 1.0gm
- Distilled water 20 ml
- Dissolved and added 95% alcohol 80 ml

Eosin was dissolved in water and then 80 ml of 95% alcohol was added.

3. Working eosin solution

- Eosin stock solution 1 part
- Alcohol, 80% 3 parts

0.5ml of glacial acetic acid was added to 100ml of working eosin solution just before use.

Procedure of Routine Hematoxylin and Eosin Staining

1. Deparafinization in Xylene: The sectioned tissue were deparaffinized in three changes of xylene (three minutes in each change)

2. Rehydration in descending grades of alcohol

- Absolute alcohol – three changes (three minutes for each change)
- 95% alcohol - two minutes
- 80% alcohol - two minutes
- 70% alcohol - two minutes

3. Dipping with distilled water for 10 minutes.

4. The tissue were stained with Ehrlich's Hematoxylin for 2 – 10 minutes.

5. Washing in running tape water (10-15 min)

6. Dipping in lithium carbonate (few dips)

7. Staining in Eosin solution for 1 min.

8. Dehydration in ascending grades of alcohol as following:

- 95% alcohol – three changes (2-4 dips for each change)
- Absolute alcohol – three changes (2-3 minutes for each change)

9. Cleaned in Xylene: three changes (five minutes for each change).

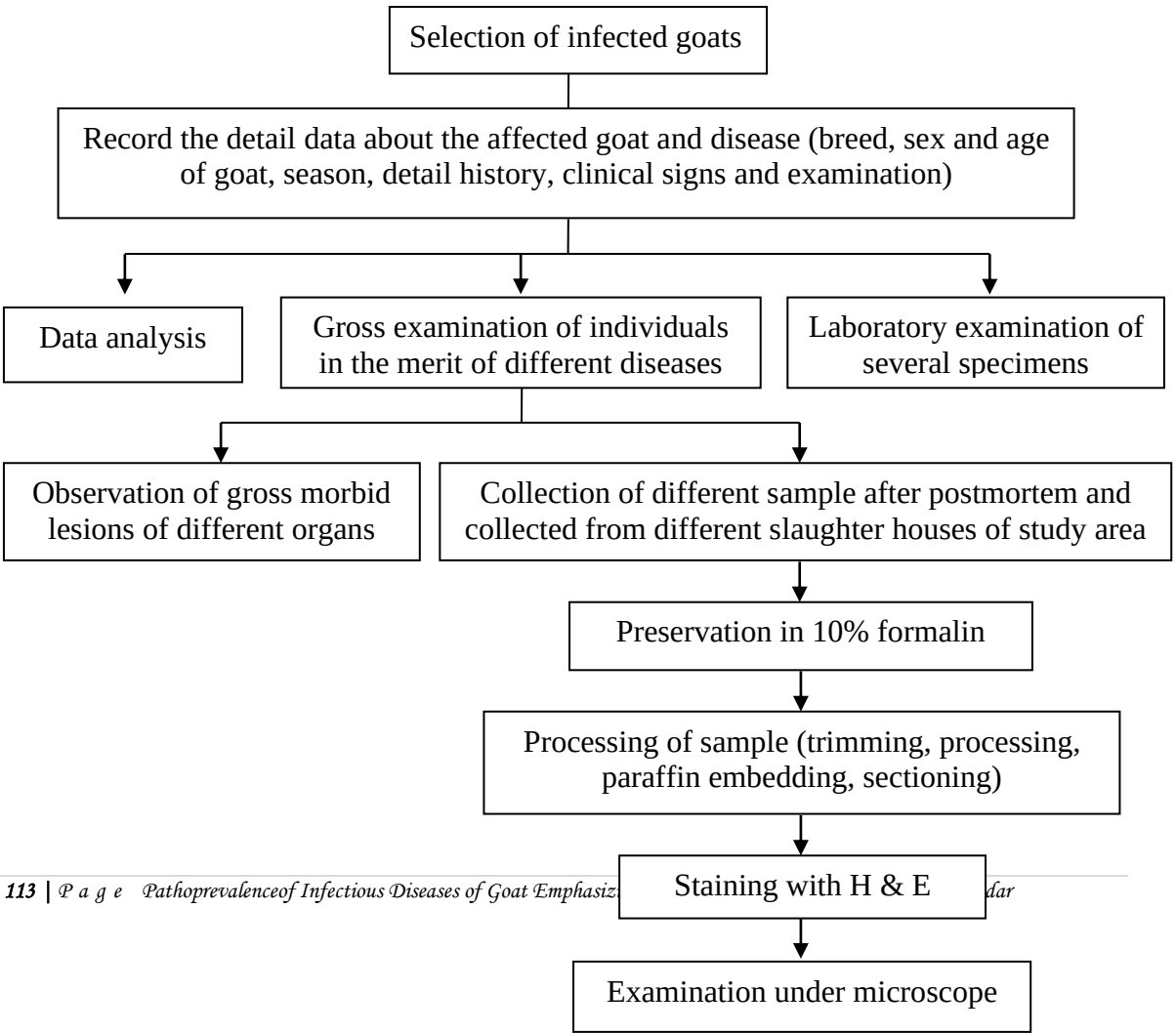
10. Tissues are mounted with cover slip by using suitable mounting media (DPX) or Canada Balsum.

11. Observation of the tissues under microscope using low and high magnification.

3.4. Photography

The histopathological slides of endoparasite affected organs were placed under microscope (Leica, Germany) and the respective microphotographs were taken directly by a digital camera (SAMSUNG ST56, 16.1 MEGAPIXEL, CHAINA) using both low and high objectives (X4, X10). The photograph were then placed in computer, image selection and magnification were further modified and placed in the thesis for better illustration of the results.

3.5. Experimental Layout



CHAPTER IV

RESULTS

4.1. Overall prevalence of Infectious Diseases in goats

During this study, the infectious diseases 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%). Among the viral diseases mostly founded infection was PPR (28.56%) and then contagious ecthyma (0.37%). Among the bacterial diseases prevalence of infectious arthritis was (1.50%), (0.75%) foot rot and (0.75%) cases of tetanus .In the category of fungal infection, dermatophytosis (1.83%) was common. Under the protozoal infection (1.59%) cases of coccidiosis and (0.42%) babesiosis were founded. A large number of external parasitic diseases were observed in this study, among them (5.75%) cases of lice infestation, (1.26%) cases of scabies, (0.89%) cases of myiasis and (0.18%) cases of tick infestation were founded along with internal parasitic diseases having a total (9.12%) of mixed internal helminth, (0.51%) cases of gid diease, (0.09%) cases of ascariasis and (0.09%) case of filariasis. In the mixed infectious diseases, (17.67%) cases of Upper Respiratory Tract Infection, (12.62%) cases of Pneumonia, (4.16%) cases of infectious diarrhoea, (3.74%) case of metritis, (2.67%) cases of dermatitis, and (2.29%) were in the case of mastitis, (1.87%) case of urinary tract infection and (1.03%) cases of keratoconjunctivitis (Table-1)

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 (Jul-Oct)	Winter (Nov-Feb)	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 Echthyma	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, RTI=Respiratory Tract Infection, UTI= Urinary Tract Infection, G= Group

4.2. Breed related prevalence of infectious diseases in goats

Prevalence of infectious diseases of goat was statistically higher in Jamunapari (55.12%) than the Black Bengal (44.88%). In case of viral infection Jamunapari (16.22%) were more commonly affected than Black Bengal (12.71%) where in PPR, prevalence was comparatively higher in Jamunapari (15.94%) than Black Bengal (12.62%) and contagious ecthyma was common in Jamunapari (0.28%) than the Black Bengal (0.09%). In bacterial diseases, jamunapari *(1.97%)* were commonly infected than Black Bengal (1.03%) where in infectious arthritis, Jamunapari (0.98%) was more susceptible in comparison to Black Bengal (0.51%), in foot rot also Jamunapari (0.60%) than Black Bengal (0.14%) but in Tetanus both Jamunapari (0.37%) and Black Bengal Goat (0.37%) were equally affected. In Dermatophytosis, Jamunapari (0.65%) breed was less susceptible in comparison to Black Bengal (1.17%). In case of protozoal infection Jamunapari (1.21%) were more susceptible than Black Bengal (0.80%) where in coccidiosis the Jamunapari (0.98%) goat breed were commonly affected than the Black Bengal (0.61%) but in babesiosis the infection were more or less similar in both breed. In External parasitic Diseases Jamunapari (5.47%) were commonly affected than Black Bengal (2.95%) where the prevalence of Lice infestation, Scabies, myasis, tick infestation and mite infestation were higher in Jamunapari (3.83%, 0.75%,0.56%, 0.19% and 0.14% respectively) than the Black Bengal (1.92%, 0.51%, 0.33%, 0.05 % and 0.14% respectively). The prevalence of internal parasitic diseases was also relatively higher in Jamunapari (5.24%) than Black Bengal (4.53%). Where in mixed internal helminth, Jamunapari (4.82%) were infected more than the other, in gid disease Japunapari (0.28%) were commonly affected and in ascariasis only Japunapari (0.28%) were affected. Also in case of mixed infectious diseases, prevalence in Jamunapari (24.36%) was relatively higher than Black Bengal (21.68%). In upper respiratory tract infection, Jamunapari (9.12%) were commonly affected than Black Bengal (8.55%). Jamunapari (6.31%) affected more than Black Bengal (6.31%) were equally infected inpneumonia. Diarrhoea was also common in Jamunapari (2.57%) than the Black Bengal (1.59%). Metritis was common in the Black Bengal (1. 92%) than Jamunapari (1.82%). Dermatitis was comparatively higher in Jamunapari (1.50%) than Black Bengal (1.17%). Jamunapari (1.31%) breed was less susceptible in comparison to Black Bengal (0.98%) incase of mastitis. Keratoconjunctivitis was common in Jamunapari (0.70%) than Black Bengal (0.33%) (Table -2).

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 Echthyma	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
Myasis	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, RTI= Respiratory Tract Infection, UTI= Urinary Tract Infection; ** = Significant at (P<0.05)

4.3. Sex related prevalence of infectious diseases in goats

In this study, it was detected 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%) where in PPR, female (15.15%) were more susceptible than the male (13.41%) but in CE both male and female were equally susceptible. In bacterial infection prevalence was relatively higher in female (1.64%) than male (1.36%). From the bacterial infection, the infectious arthritis was equally affected both in male and female and others like foot rot and tetanus were frequently higher in female (0.42%, 0.47%) than male (0.33%. 0.28%). In dermatophytosis, female (1.36%) were more susceptible than male (0.47%). In protozal infection, male (1.40%) were more susceptible than female (0.61%) where in coccidiosis, male (1.26%) were mostly affected than female (0.33%) but in babesiosis, female (0.28%) were more affected than male (0.14%). Prevalence of external parasitic diseases was relatively higher in female (5.32%) than male (3.10%) where the prevalence of lice infestation, scabies, mite infestation and tick infestation were relatively higher in female (3.93%, 0.65% and 0.23% and 0.14% respectively) than male (1.82%, 0.61%, 0.10% and 0.05% respectively), but in myiasis male (0.51%) are infected than female (0.37%). In internal parasitic diseases, relatively higher prevalence was occur in female (5.33%) than male (4.44%) where, the prevalence of all the infection like mixed internal helminth, gid disease and ascariasis were comparatively higher in female (5.10%, 0.14% and 0.09% respectively) than male (4.02%, 0.37% and 0.05% respectively) and the prevalence of mixed infectious diseases was comparatively higher in female (24.73%) than male (21.31%). In upper respiratory tract infection, infectious diarrhoea, dermatitis, urinary tract infection and keratoconjunctivitis, all the cases were comparatively higher in male (2.38%, 1.64%, 0.98% and 0.75% respectively) than female (1.78%, 1.03%, 0.89% and 0.28% respectively).

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 Echthyma	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 =	**978(45.68)**	**1161(54.32)**	6.09*

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

4.4. Age related prevalence of infectious diseases in goats

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%). Prevalence of viral diseases were relatively higher in G-1(16.03%), followed by G-2 (8.04%) and G-3 (4.86%). From viral infection in PPR prevalence were higher in G-1 (15.94%), than other two groups, G-2 (7.95%) and G-3 (4.67%) but in case of contagious echthyma the prevalence were comparatively higher in G-3 (0.19%) than others. Prevalence of bacterial diseases was also higher in G-1 (1.40%) followed by G-2 (1.12%) and G-3 (0.48%) where all the infections like Infectious arthritis, foot rot and tetanus, prevalence were comparatively higher in G-1 (0.84%, 0.19% and 0.37% respectively) than the G-2 (0.47%, 0.37% and 0.28% respectively) and G-3 (0.19%, 0.19% and 0.10% respectively). 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%). In protozoal infections, prevalence were relatively higher in G-1 (1.03%)than G-2 (0.84%) and G-3 (0.14%) where in coccidiosis, goats of G-1 (1.03%) were commonly affected than G-2(0.56%) and the infection was absent in G-3 but in babesiosis prevalence were common in G-2 (0.28%) than G-3 (0.14%). Prevalence of external parasitic infestation was comparatively higher in G-2 (4.11%) than G-1 (2.81%) and G-3 (1.50%). In maximum external parasitic infection, like lice infestation, myiasis, mite infestation and tick infestation prevalence were higher in G-2 (2.95%, 0.33%, 0. 23% and 0.14 % respectively) than the other age groups but in scabies prevalence were higher in G-1 (0.75%) than G-3 (0.46%) and G-3 (0.05%). Like other infections, the prevalence of internal parasitic infestation were higher in G-2 (5.43%) than G-1 (2.28%) and G-3 (2.06%), where in mixed internal helminh infestation were commonly higher at the age of G-2 (5.14%) than the G-1 (2.10%) and G-3(1.88%). In gid disease, prevalence were higher in G-2 (0.23%) followed by G-3 (0.19%) and G-1(0.09%) but ascariasis was founded only in G-1 (0.09%). Prevalence of mixed infectious diseases was comparatively higher in G-1 (21.32%) than G-2 (16.32%) and G-3 (8.50%). Except the metritis, mastitis and urinary tract infection all other mixed infection like Upper Respiratory tract infection, pneunonia, infectious diarrrhoea and keratoconjuctivitis, prevalence were higher in G-1 (10.00%, 7.39%, 2.20% and 0.42% respectively) followed by G-2 (5.14%, 1.35%, 1.73% and 0.33% respectively) and G-3 (2.52%, 1.35%, 0.23% and 0.28% respectively) (Table-4)

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 Echthyma	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, RTI= Respiratory Tract Infection, UTI= Urinary Tract Infection; G=Group; NS = Not Significant at (p>0.05)

4.5. Season related prevalence of infectious diseases in goats

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%). From viral infection prevalence of PPR was higher in rainy season (10.57%), followed by summer (9.30%) and winter (8.69%) but in case of contagious echthyma prevalence was founded only in winter (0.37%). Prevalence of bacterial diseases was also higher in winter (1.31%) followed by rainy (0.94%) and summer (0.75%) where in Infectious arthritis, prevalence was higher in winter (0.70%), in foot rot prevalence were common in rainy (0.47%) and tetanus affection was higher in winter (0.33%). Prevalence of dermatophytosis was higher in the winter (1.03%) than others. In protozoal infections, prevalence was relatively equal in all seasons like in rainy (0.66%), winter (0.65%) and summer (0.70%). Prevalence of external parasitic infestations was comparatively higher in summer (3.74%) than winter (3.18%) and rainy (1.50%). In lice infestation, prevalence were commonly affected in winter season (2.71%) and in summer (2.57%) than in rainy (0.47%), in myiasis prevalence was common in summer season (0.66%) and in rainy (0.23%) but absent in winter, in mite infestation and tick infestation prevalence were higher in rainy season (0.28%, 0.19%) but in scabies, prevalence was higher in summer (0. 51%) than winter (0.42%) and rainy (0.33%).The prevalence of internal parasitic infestation were higher summer (3.69%) than winter (3.51%) and rainy (2.57%), where mixed internal helminh infestation were higher at summer (3.69%) than the winter (2.90%) and rainy season (2.52%). In gid disease, prevalence was higher in winter (0.47%) followed by rainy (0.05%) and absent in summer. Prevalence of mixed infectious diseases were comparatively higher in rainy season (16.32%) followed by summer (14.95%) and winter (14.77%). In Upper Respiratory tract infection prevalence were comparatively higher in summer (6.17%) and equal in both rainy and winter (5.75%). In pneunonia prevalence were higher in rainy season (5.38%), followed by winter (4.39%) and summer (2.85%), in infectious diarrrhoea prevalence was more or less similar in all seasons and in metritis, mastitis and urinary tract infection the seasonal variation were not much more, the prevalence of metritis were relatively higher in Rainy season (1.78%) than others In mastitis, prevalence were higher in summer (0.93%). Prevalence of UTI were comparatively higher in summer season (1.12%) whereas in Keratoconjunctivitis, prevalence was higher in winter (0.70%) than rainy (0.33%) and absent in summer.

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 Echthyma	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, RTI= Respiratory Tract Infection, UTI= Urinary Tract Infection; NS = Not Significant at (p>0.05)

4.6. Clinical signs revealed from the study

4.6.1. Viral diseases

In Pesti des Petits Ruminants (PPR), common clinical signs 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 (Fig-2).

In Contagious Ecthyma (Sour Mouth) the clinical sign were pastular and scabby lesions on muzzle, nostrils and lips (Fig-3) along with same lesions on coronets, ears, anus, vulva, prepuce and sloughing of the affected epidermal layers.

4.6.2. Bacterial diseases

Infectious Arthritis characterized by swelling in one or more joints (Fig-4), lameness, fever, occasional chills.

Foot Rot (Interdigital Necrobacillosis/ Necrotic Pododermatitis) revealed with the clinical signs of lameness also 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 (Fig-5), changed voice and inability to eat or drink, unsteady gait and convulsion. Death with protrusion of tongue

4.6.3. 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 (fig-6).

4.6.4. 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 (Fig-7)

Babeiosis was recognized by dark reddish brown urine with high fever, imappetance, dyspnoea, and anaemia.

4.6.5. 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, digits, 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 and tissue fluid from the wound.

4.6.6. Internal parasitic diseases

Gid was diagnosed by the clinical signs of circling movement, 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’ (Fig-8).

4.6.7. Mixed infectious diseases

Upper respiratory tract infection was menifested 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, imappetance, weight loss, lethargy and dullness (Fig-9)

In infectious diarrhoea, clinical signs were profuse amounts of liquid feces with dehydration, weakness, depression and recumbancy. 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 (Fig- 11)

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. (Fig-10)

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 (Fig-12).

4.7. Gross lesions revealed from the study

4.7.1. Viral diseases

The PPR effected goats exhibited scab and crust formation on nasal mucosa, mucopurulent exudate from nasal opening to larynx, hyperaemia of trachea and bronchi, congestion and oedema of lungs (Fig-14). Haemorrhagic, congested enteritis with gas accumulation (Fig-15). Haemorrhage and ulceration in ileo-caecal junction, colon and rectum forming "**zebra stripes**" (Fig-15) and enlarged spleen.

In contagious ecthyma grossly founded lesions were sloughing of the affected epidermal layer from muzzle and lips (Fig-16)

4.7.2. Bacterial Diseases

Grossly founded lesions were reddened, moist and latterly horney tissues between the hooves in foot rot (Fig-17).

4.7.3. External parasitic Diseases

In scabies the gross lesions were characterized by the presence of small red papules and general erythema, thickening and wrinkling on the affected parts of skin with alopecia (Fig-18).

In myiasis there were presence of large number of maggot at the point of wound opening with bleeding and exudation (Fig-19).

4.7.4. Internal parasitic Diseases

In ascariasis, grossly there was pale spot which extended shortly in liver parenchyma (Fig-20).

Several parasitic infestations were recorded with some gross lesions in mixed internal helminth infestation, where

In schistosomiasis the commonly founded lesions were, the liver was firm and pale in color (Fig-21).

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 (Fig-22).

Grossly nodule formation was commonly observed in the mucosa at any point from the pylorus to the anus at *Oesophagostomum columbianum* infection. Nodules were hard, raised, and slightly yellowish in color (Fig-23).

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 (Fig-25).

4.7.5. Mixed Infectious Diseases

In pneumonia there was presence of hemorrhages and in some cases congestion in lung. In addition, the lung was consolidated on palpation. All lungs showed severe hemorrhage and gray hepatization. Lungs surface were irregular in shape due to whitish to yellowish color of fibrin as a layer covered it (Fig-26).

Mastitis was macroscopically characterized by congestion with haemorrhage and oozing turbid purulent bloody secretion during the period of lactation while few cases were fibrosed with pale discolouration (Fig-24).

4.8. Microscopic lesions revealed in internal parasitic diseases from the study

In ascareasis, microscopically we found parasitic granuloma composed of longitudinal section of larva in liver parenchyma surrounded by lymphocytic proliferation with fibrosis (Fig-28).

In schistosomiasis, 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 (Fig-29). In Spleen there was hemosiderosis throughout the spleenic parenchyma (Fig-30).

In fascioliasis, 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 chirrhosis with mononeuclear inflammatory and lymphocytic proliferation throughout the liver debris of worm in the intrahepatic bile duct with thickened blood vessel due to fibrosis (Fig-31. 32).

In hydatidosis, there were hydatid scolex in the central vein surrounded by fibrosis with severe scattered of inflammatory cells surrounding the fertile cyst and finally completely autolization of liver (Fig-34). In case of lung, microscopically there was multicystic lung and cysts containing several scolices with germinal lining and fibrosis in lung parenchyma causing destruction of pulmonary alveoli (Fig-36). In the spleen there was scolex in the parenchyma with huge reactive cell infiltration with diffused edema in trabicule (Fig-37).

Clinical Signs of Different Infectious Diseases of Goat

Fig-2: Diarrhoea Characterized with Soiled Hindquarter with Liquid Feces (PPR)

Fig-3: Scabby Lesions on Muzzle, Nostrils and lips (Contagious Ecthyma)

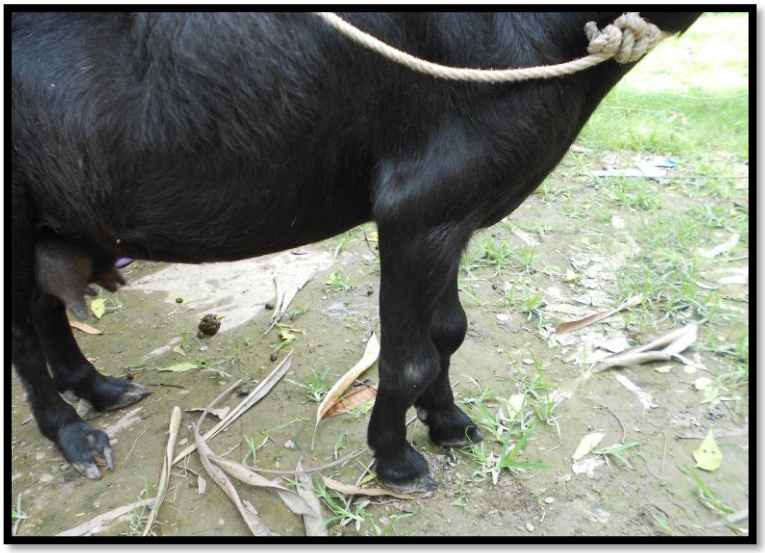


Fig-4: Swelling of the Elbow Joint of both Fore Limbs (Infectious Arthritis)

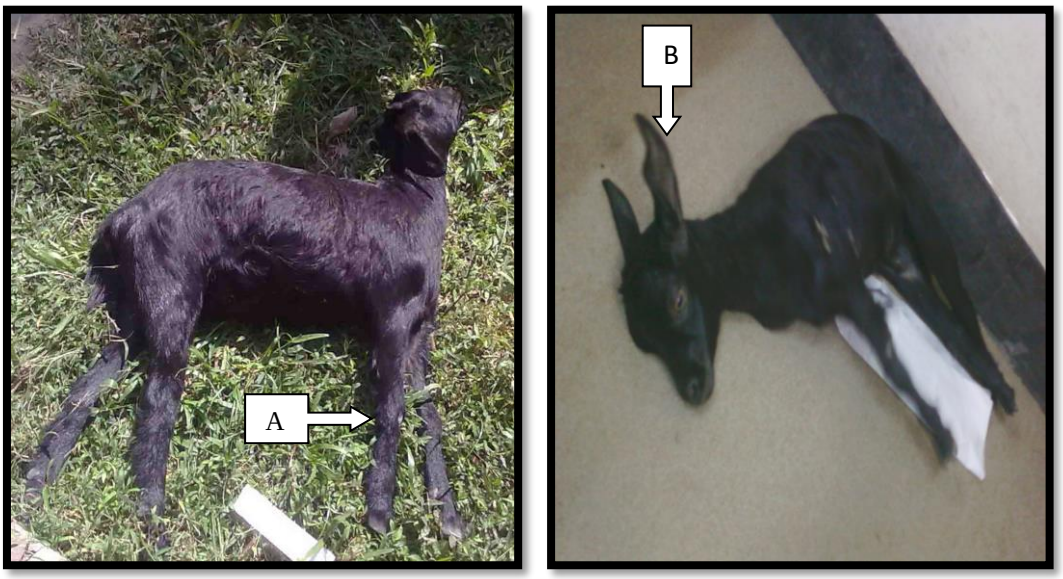


Fig-5: A. Stiffed Limbs of Dead Goat, B. Erected Ears of Affected Goat (Tetanus)

Fig-6: A. Hair loss in Rounded lesion on Ear; B. White Crusty Appearance on Skin of Tail (Dermatophytosis)

Fig-8: A. Poor Body Condition with Distended Abdomen (Internal Parasitic Infestation); B. Bottle Jaw in Fascioliasis

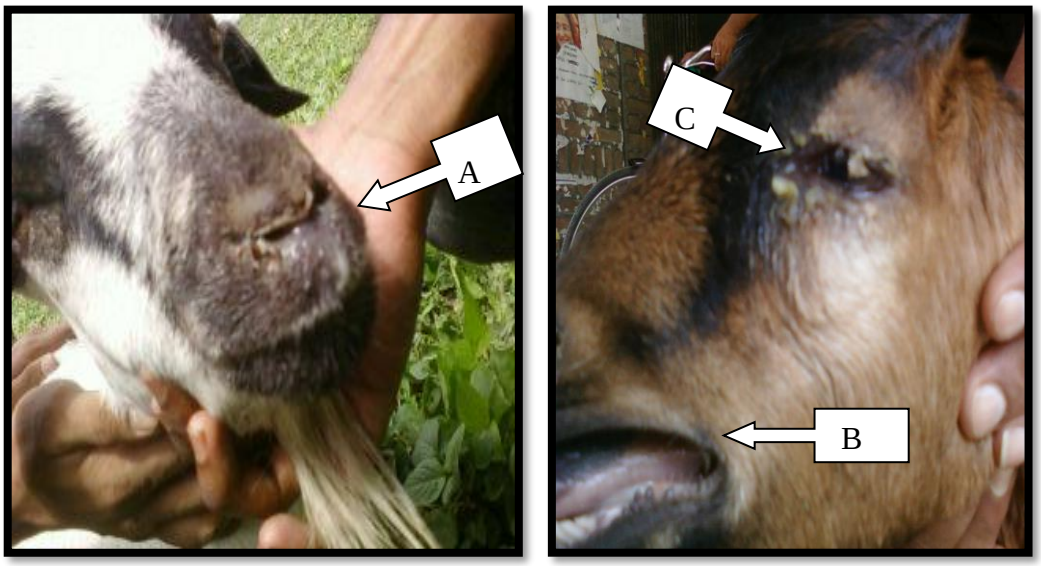


Fig-9: A. Nasal Discharge, B. Gasping breathing, C. Purulent Discharge from Eyes (Pneumonia)

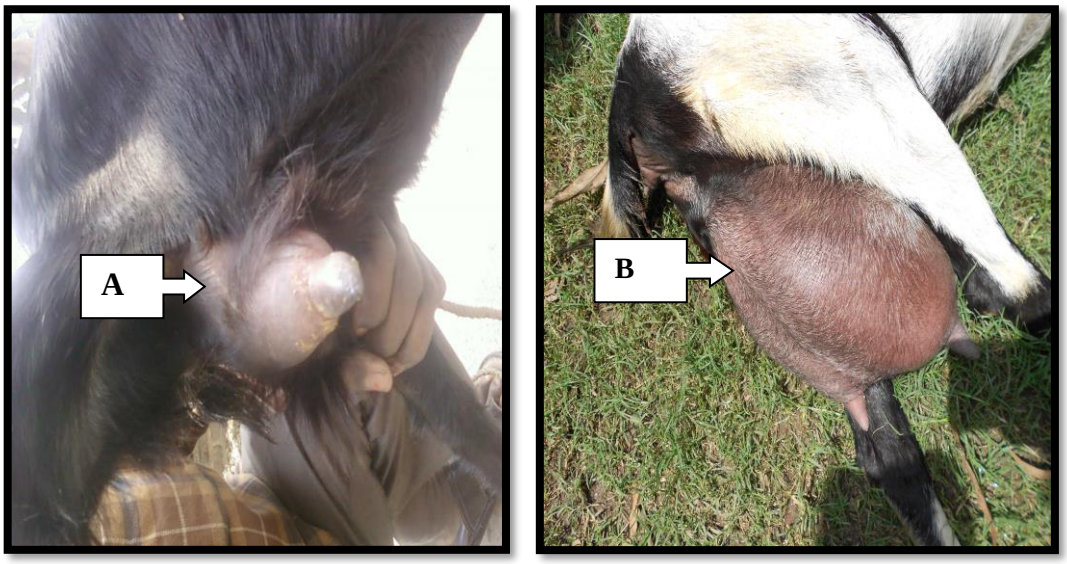
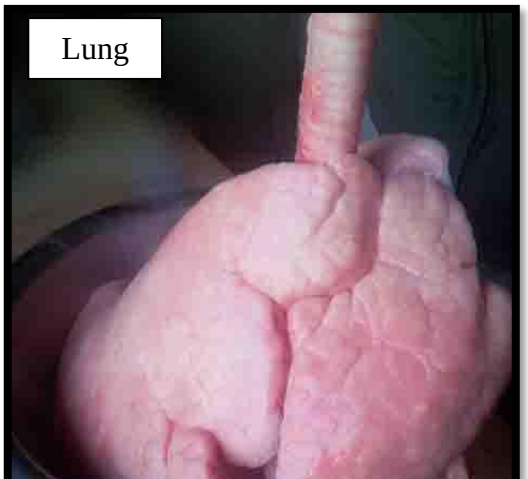


Fig-10: A. Unilateral Mastitis with swollen udder, B. Bilateral Mastitis with Reddened and Swollen Udder

A

Fig-12: Arrows Show Corneal Opacity with Lacrimation

Gross Lesions of Different Infectious Diseases of Goat



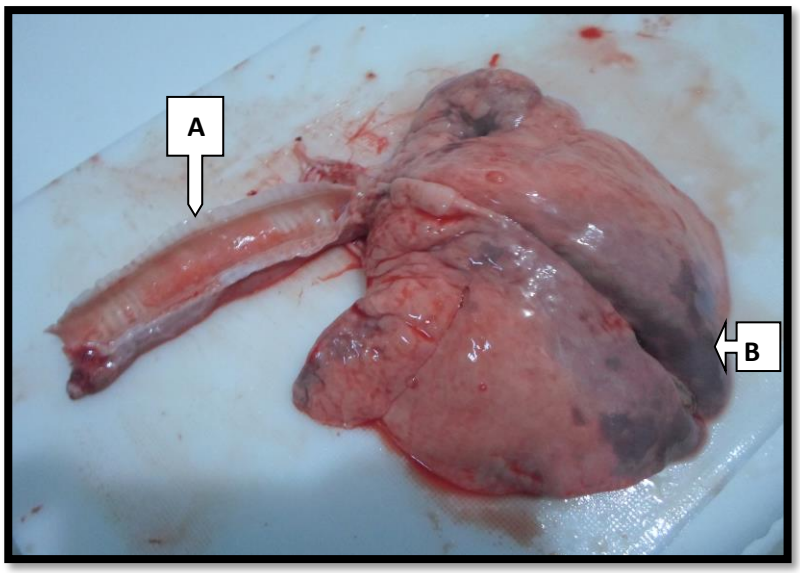


Fig- 14: A. Frothy Exudates in the Lumen of Hyperemic Trachea, B. Congested and edematous Lung (PPR)

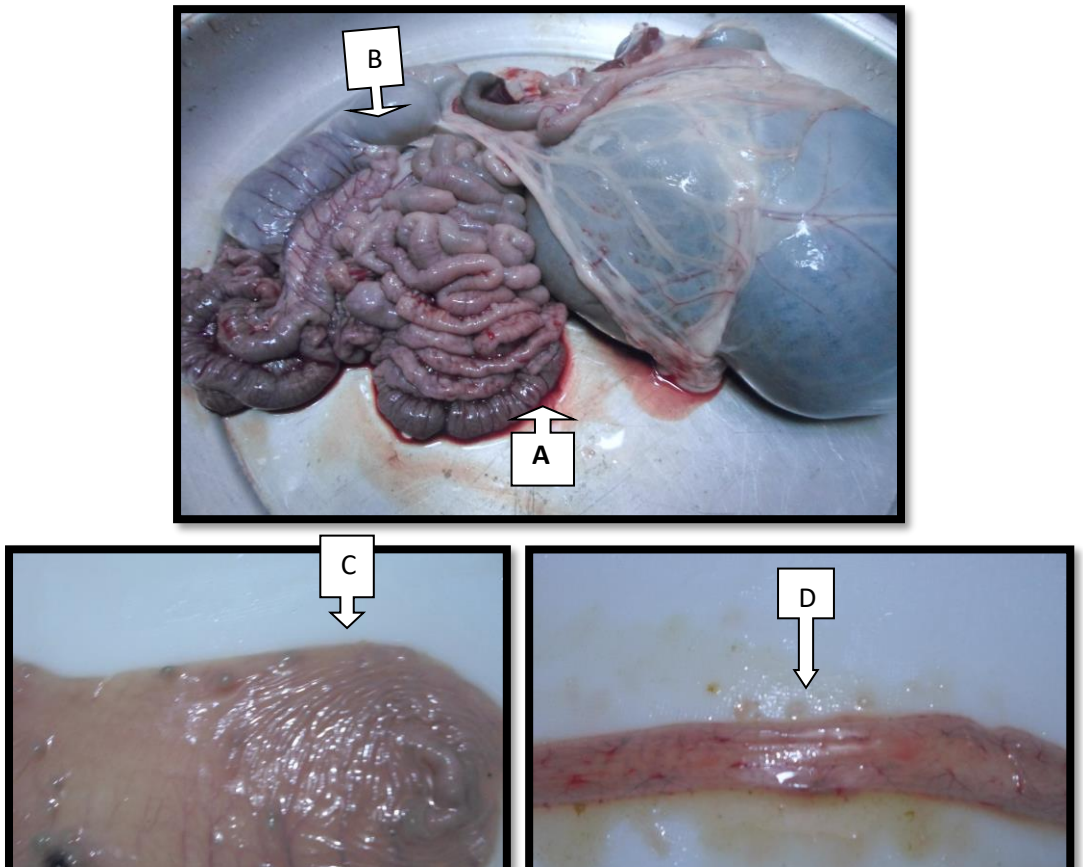


Fig-16: Sloughing of the Affected Epidermal layer from Muzzle and Lips (Contagious Ecthyma)

Fig-17: Horney Tissue Formation in between the Space of Two Hooves (Foot rot)

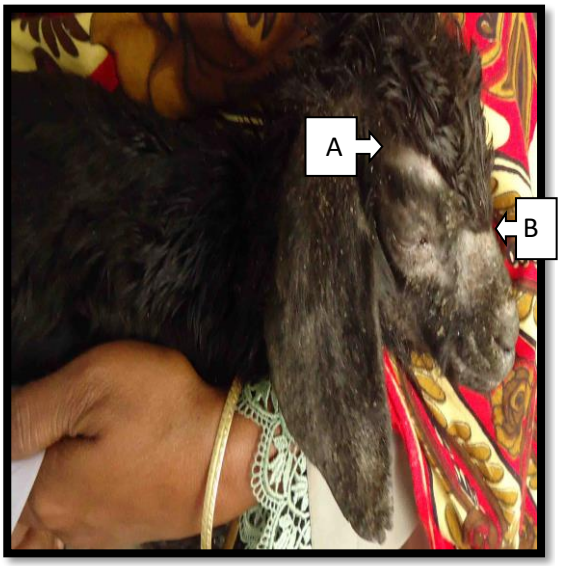


Fig- 18: A. Extensive Hair Loss around the Eyes B. Thickening of Dermis along with Alopecia on Face (Scabies)

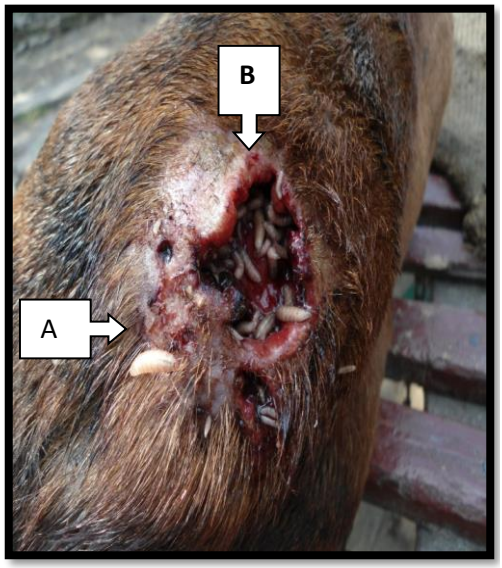


Fig-19: A. Maggots come out from Lesion B. bleeding and Exudation from Wound (Myiasis)

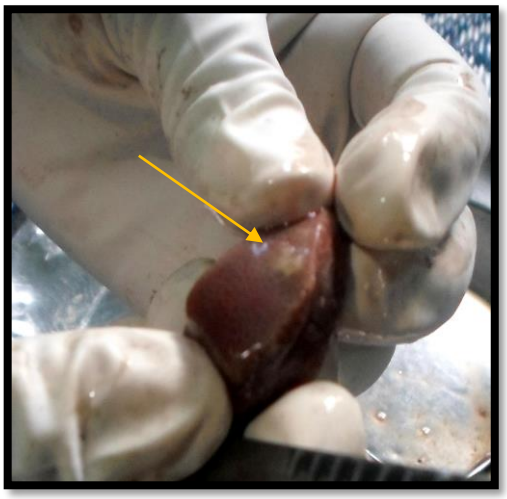


Fig-20: Arrow Shows Pale Spot which Extended Shortly in Liver Parenchyma (Ascariasis)

Fig-21: Firm and Pale liver with Fibrosis (Schistosomiasis)

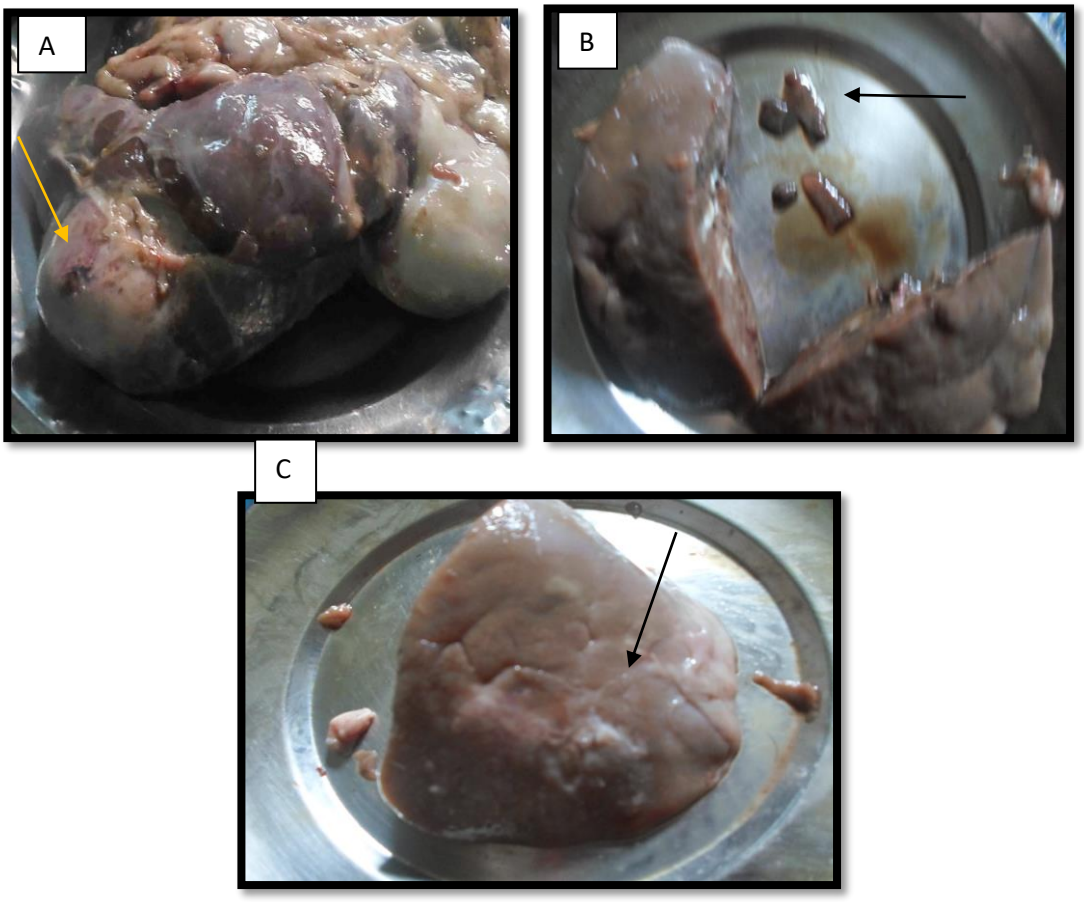


Fig-22: A. Acute Inflammation with Fibrosis (Arrowed) of Liver, B. Adult Fluke (Arrowed) Comes out from Liver, C. Pale colored Liver with Swollen Fibrotic mass. (Fascioliasis)

Fig-23: Hard, Raised and Yellowish nodule formation in the mucosa of colon (*O. columbianum* infection)

Fig-24: Arrow Indicates the Blood Come out Form Infected Udder (Mastitis)

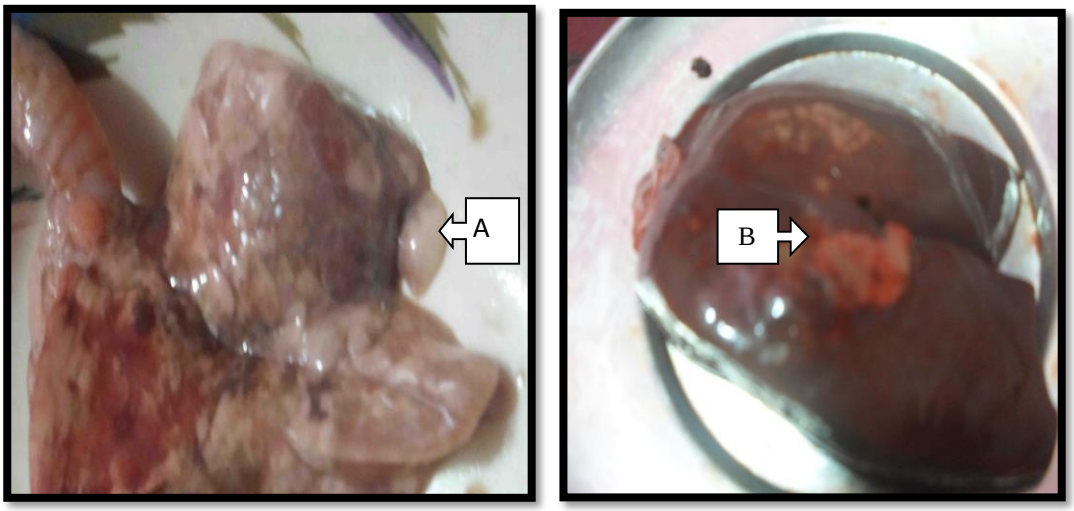


Fig-25: A. Grape Shaped Cyst Formation in the Lung; B. Cystic Degeneration in the Liver Parenchyma (Hydatid Disease)

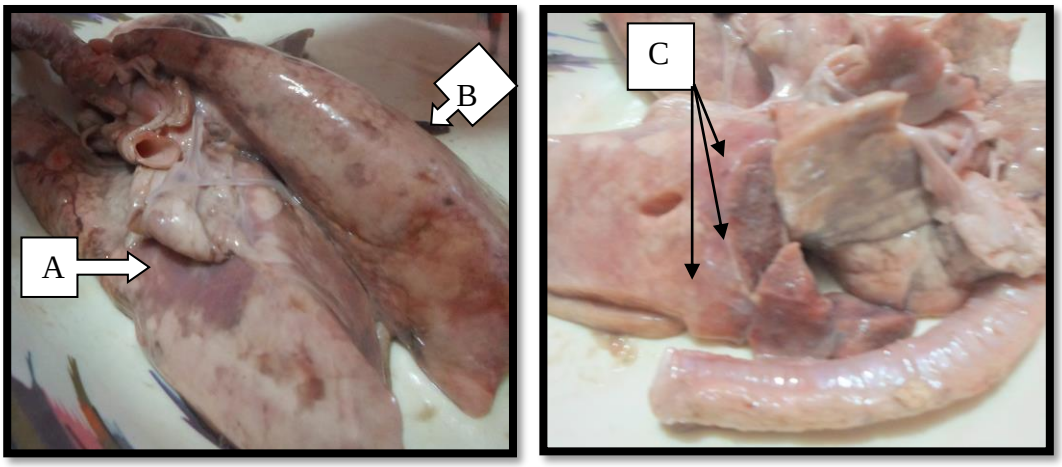


Fig- 26: A. Red Hepatization, B. Gray Hepatization, C. Arrows Show Multiple Necrotic Foci throughout the Lung with Haemorrhage (Pneumonic Lung)

Microscopic Lesions of Endopararitic Diseases

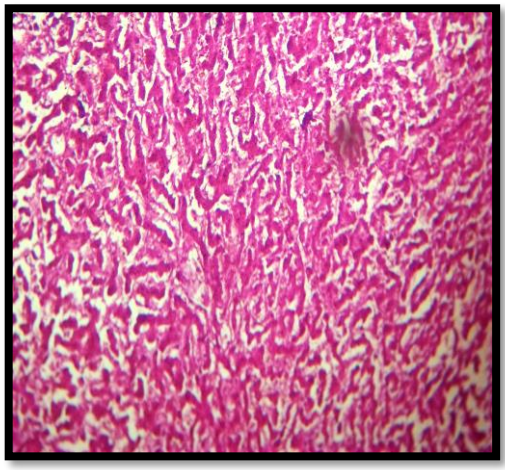


Fig- 27: Normal Cellular Pattern of Liver (H and E, 10X)

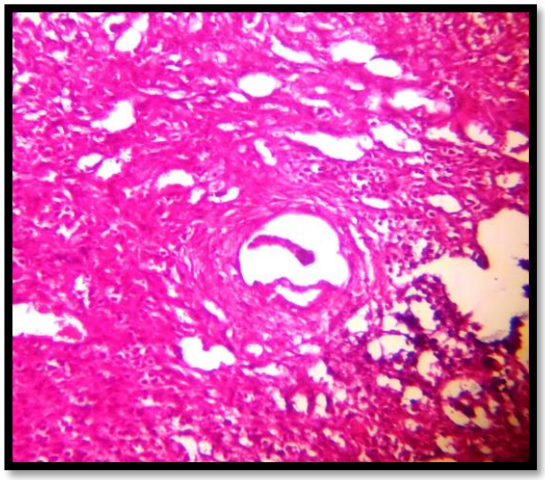
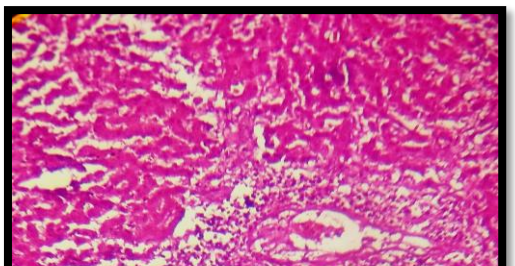
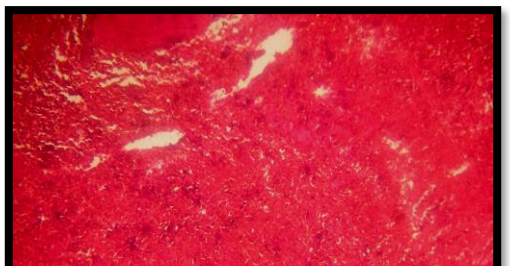


Fig- 28: Liver Showing Parasitic Granuloma Composed of Longitudinal section of Larva, Surrounded by Lymphocytic Proliferation with Fibrosis; Ascareasis(H and E, 10X)





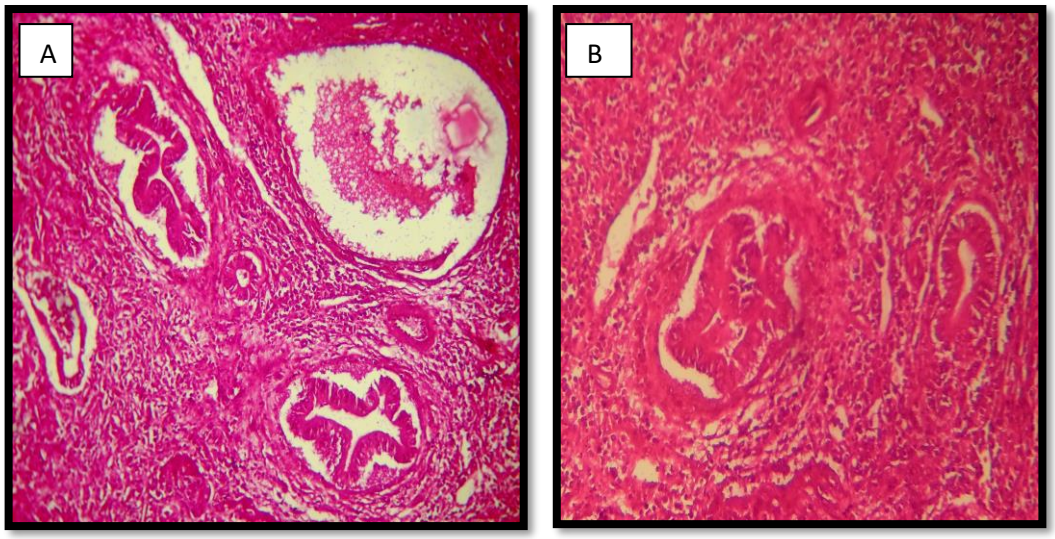
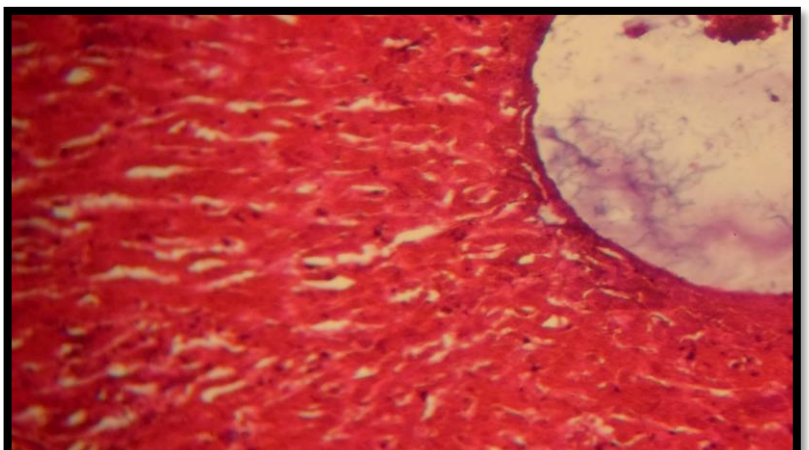


Fig-31: A. Liver Showing multiple Cross Section of Adult Worm, Thickened Blood Vessel due to Fibrosis and Debris of Worm in the Intrahepatic Bile Duct with infiltration of inflammatory cells, B. Liver Showing Longitudinal Section of Adult worm with Fibrosis which bring Pressure Atrophy to the Adjacent Hepatic Cells resulting Chirrhosis, Lymphocytic Proliferation cells; Fascioliasis, (H and E, 10X)



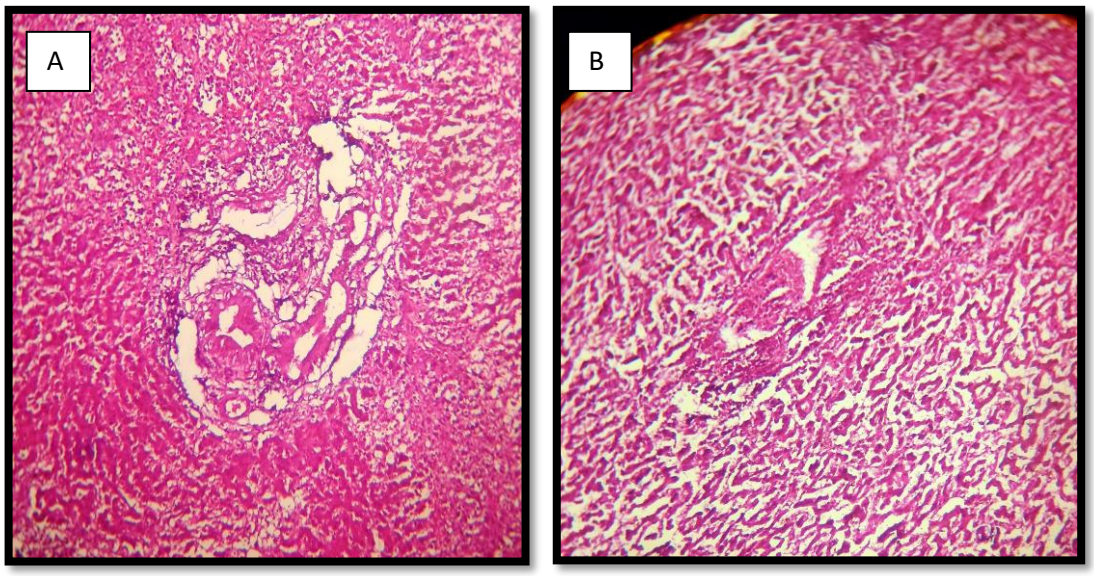
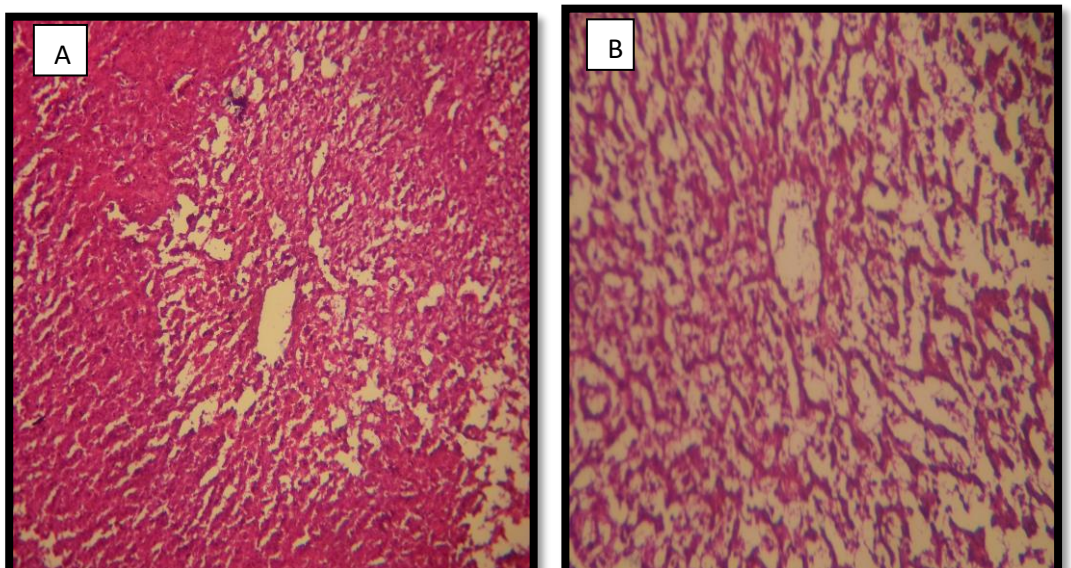


Fig-33: A. Liver Showing Hydatid Scolex in the Central Vein Surrounded by Fibrosis, B. Liver Showing Fibrosis with severe scattered of inflammatory cells surrounding the fertile cyst; Hydatidosis (H and E, 10X)



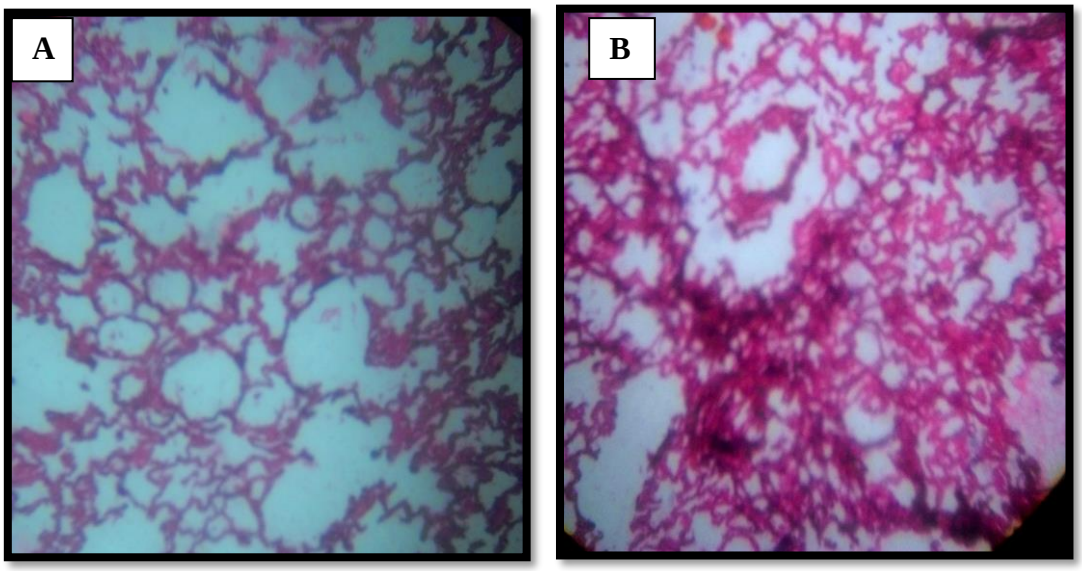


Fig- 35: A. Apparently Normal Structure of Lung. B. Alveolar Destruction with Inflammatory Cells Infiltration; Hydatidosis (H and E, 10X)

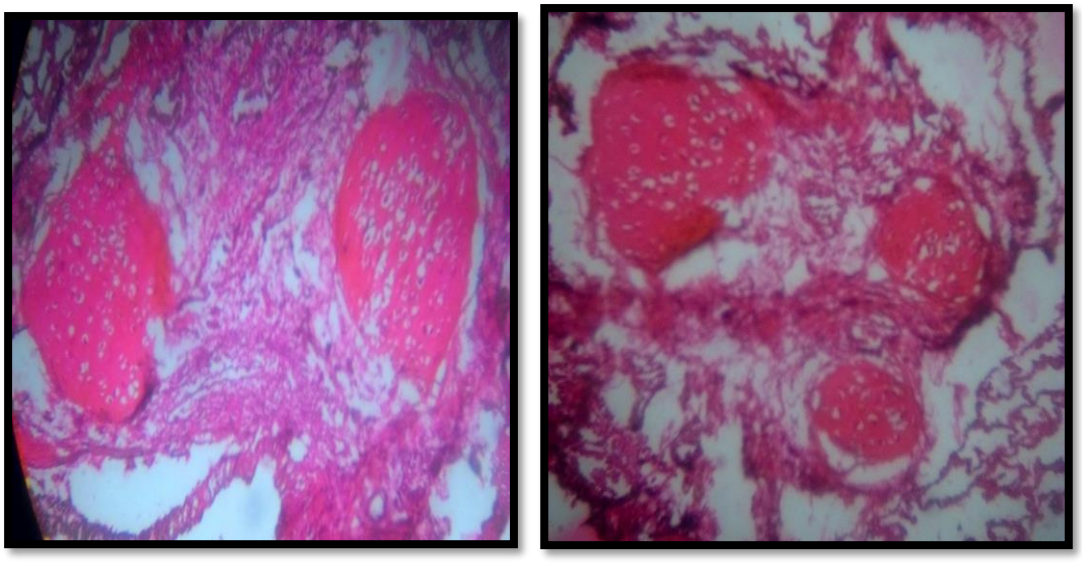


Fig-36: A. Daughter Cyst having Scolex and Germinal Lining with Fibrosis in Lung Parenchyma Causing Destruction of Pulmonary Alveoli, B. Multicystic Lung and Cysts Containing Several Scolices; Hydatidosis (H and E, 10X)

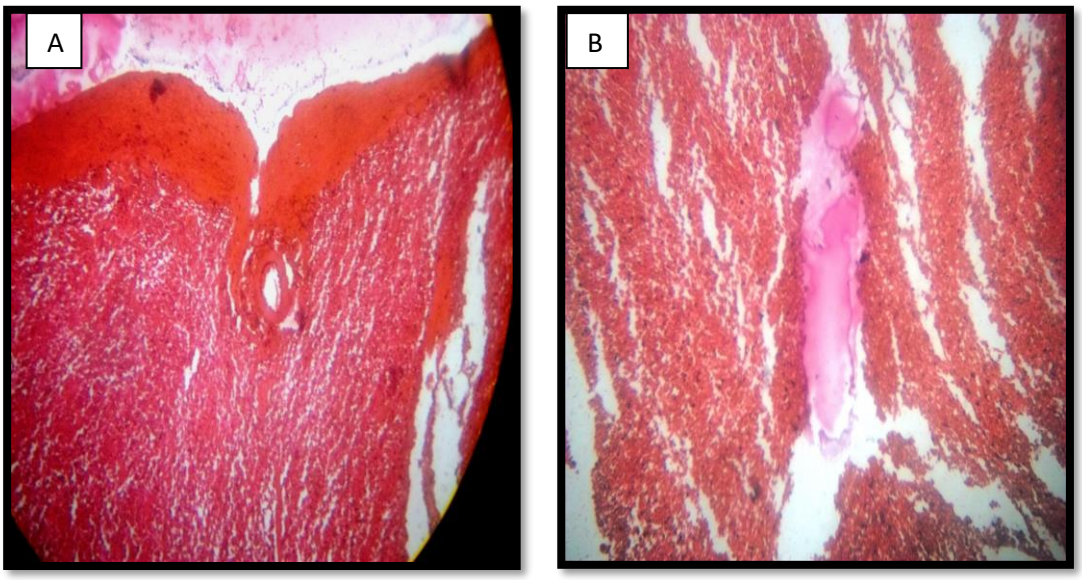


Fig- 37: A. Scolx in the Splenic Parenchyma, B. Reactive Cell Infiltration with Huge Diffused Edema in Trabicule; Hydatidosis (H and E, 10X)

CHAPTER V

DISCUSSION

During recent observation from July, 2014 to June, 2015 this study found a group of viral, bacterial, fungal, protozoal, external parasitic disease, internal parasitic diseases and mixed infectious diseases of goat . A pathological investigation was performed on endoparasitic diseases.

Infectious diseases are a global problem and considered as a major obstacle in the health and productive performance of livestock specially goats (Nath, 2014).The prevalence of different diseases in a particular area depends on various factors like geo-climatic condition, biological barriers, immunization status, social awareness etc. A thorough knowledge about the prevalence of diseases in an area, their epidemiology including morbidity and mortality patterns, pathogenesis and pathology of the disease is the

requisite for proper diagnosis of the maladies as well as in the prevention and control strategies of the diseases. Mass immunizations against a particular disease without knowing about the prevalence of that disease in the area cause not only economic loss in term of vaccination cost but also stress the animals, making them more susceptible to other diseases. Moreover the emphasis should be given upon the pathoprevalence of common infectious diseases of a particular area. The values obtained in the present investigation reflect the total impression of different infectious diseases at Dinajpur.

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.

In present study the 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%).In this study the prevalence of viral diseases specially PPR was significantly higher in Jamunapari (16.22%)(at $P<0.05$)than Black Bengal (12.71%), among the bacterial diseases, the jamunapari *(1.97%)* were commonly infected than Black Bengal (1.03%). In Dermatophytosis, Jamunapari (0.65%) breed was less susceptible in comparison to Black Bengal (1.17%) and in protozoal infection, Jamunapari (1.21%) were more susceptible than Black Bengal (0.80%). In External parasitic diseases Jamunapari (5.47%) were commonly affected than Black Bengal (2.95%) and the prevalence of internal parasitic

diseases (9.77%) was also relatively higher in Jamunapari (5.24%) than Black Bengal (4.53%) and in case of mixed infectious diseases, infection in Jamunapari (24.36%) was relatively higher than Black Bengal (21.68%) which are in agreement with Nath*et.al*. (2014). 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.

In this study, it was detected that prevalence of infections was significantly higher in females (54.32%)(at P<0.05)than the male (45.68%)similar record was found in Nath *et al.* (2014). In case of viral infection, female (15.34%) were commonly affected than male (13.60%) agreed with Nath *et al.* (2014), Parvez *et al.* (2014) and Ali *et. al* (2011).The prevalence of bacterial infection was relatively higher in female (1.64%) than male (1.36%) similar with Parvez*et al.* (2014) but dissimilar with Nath *et al.* (2014).In dermatophytosis female (1.36%) were more susceptible than male (0.47%), this finding supports the observation of Nath *et al.* (2014). Prevalence of both external parasitic diseases (8.42%) and Internal parasitic Diseases (9.77%) was relatively higher in female (5.32% and 5.33%) than male (3.10% and 4.44%)similar result found in Parvez *et al.* (2014), Ali *et al.* (2011) and Rony *et al*. (2010**)**.In the Mixed infectious diseases (46.04%) prevalence was comparatively higher in female (24.73%) than male (21.31%) where only in upper respiratory tract infection, infectious diarrhoea, dermatitis, urinary tract infection and keratoconjunctivitis, all the cases were comparatively higher in male (2.38%, 1.64%, 0.98% and 0.75% respectively) than female (1.78%, 1.03%, 0.89% and 0.28% respectively). These results vary with the reports of Nath *et al*. (2014), Parvez *et al.* (2014) and Ali *et al.* (2011). In this present and previous observations, in most of the infections were found in female than male, 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). Prevalence of viral diseases were

relatively higher in G-1(16.03%), followed by G-2 (8.04%) and G-3 (4.86%) respectively, this findings is similar to Rahman *et al.* (2015) and Nath *et al.* (2014). Prevalence of bacterial diseases was also higher in G-1 (1.40%) followed by G-2 (1.12%) and G-3 (0.48%) respectively, the same result revealed in Parvez *et al.* (2014) and Nath *et al.* (2014). In protozoal infections, prevalence was relatively higher in G-1 (1.03%) than G-2 (0.84%) and G-3 (0.14%) agreed with Nath *et al*. (2014) and Silva *et al.* (2014). Prevalence of external parasitic infestation was comparatively higher in G-2 (4.11%) than G-1 (2.81%) and G-3 (1.50%). The findings of the present study similar to Parvez *et al.* (2014), Ali *et al.* (2011), Kashem *et al.(*2011) and Oniye *et al.* (2006). The prevalence of internal parasitic infestation were higher in G-2 (5.43%) than G-1 (2.28%) and G-3 (2.06%), this result is also similar to Ali *et. al* (2011) and Hassan *et al.* (2011). Mixed infectious diseases were comparatively higher in G-1 (21.32%) than G-2 (16.32%) and G-3 (8.50%). These findings support the observation of 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 young 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%). Prevalence of viral diseases were relatively higher in rainy season (10.57%), followed by summer (9.30%) and winter (9.06%) respectively these finding is similar to Nath *et al.* (2014) and Amin (2015) but differ from Sarkar *et al.* (2011).Bacterial diseases were more or less equal in all the seasons like winter (1.31%) followed by rainy (0.94%) and summer (0.75%), similar result found in Amin (2015). Prevalence of fungal infection was higher in the winter (1.03%) than two others i.e. summer (0.47%) and rainy (0.33%) and the protozoal infections, prevalence were relatively equal in all seasons like in rainy (0.66%), winter (0.65%) and summer (0.70%) as like found at Amin (2015) and Nath *et al.* (2014). Prevalence of external parasitic infestations were comparatively higher in summer

(3.74%) than winter (3.18%) and rainy (1.50%) respectively and the prevalence of internal parasitic infestation were higher summer (3.69%) than winter (3.51%) and rainy (2.57%), which is little more different with Amin *et al.* (2015). Prevalence of mixed infectious diseases were comparatively higher in rainy season (16.32%) followed by equal in summer (14.95%) and winter (14.77%) The finding of the present study agreed with the earlier study of Amin (2015) and Nath *et al.* (2014). 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.

Present study revealed several clinical signs of different infectious disease. From the viral diseases, in PPR common signs were high fever, sneezing, coughing, dyspnoea, serous or mucopurulent ocular and nasal discharge, dullness, erosive stomatitis, diphtheretic plaques on oral mucosa, diarrhoea mixed with blood and mucus, similar to Rahman *et al.* (2015), Kgotlele *et al.* (2013) and kumar *et al.* (2001). In case of contagious ecthymathe clinical sign were pastular and scabby lesions on muzzle, nostrils and lips, however these types of typical lesions were previously found by Kinley *et al.* (2013).Among the 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 also there were elevated body temperature, swelling of the foot, and separation of the skin which are similar to those described by Iqbal *et al.* (2011). Dermatophytosis (Ringworm) was signed by circular lesions with incomplete alopecia and thickened, flaky, skin with gray/white crust formation in the affected areas, this signs are similar with the signs described in Kalaiselvi *et.al.* (2014). Coccidiosis was characterized by the signs of persistent diarrhea containing blood and mucus with imappetance, weight loss, dehydration, rough hair coat and straining attempt to pass feces, similar lesions were mentioned by Silva *et al.* (2014) and babesiosis was recognized by dark reddish brown urine with high fever, imappetance, dyspnoea, and anaemia, similar lesions were mentioned by Onoja *et al.* (2013).Among the external parasitic diseases Lice Infestation were manifested scratching, rubbing, biting of infested areas and broken fibers, this similar lesions were also recorded by Robert North (2004). 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 similar lesions were mentioned by Marimuthu *et al.* (2015) and Giadinis *et al.* (2011). Myiasis was characterized by maggot found in the affected area with oozing of blood from the wound agreed with Tafti *et al.* (2012). Gid was diagnosed by the clinical signs of circling, head shaking, soft skull, skin over the bone become shrinkage and cyst identification and this manifestations were mentioned earlier by Amin *et al.* (2013). The clinical signs of all 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', these findings were mentioned by Prasanna *et al.* (2014), Zangana and Aziz (2012), Krishna *et al.* (2015) and Mohanta *et al.* (2007). From the mixed infections, Upper respiratory tract infection and pneumonia manifested by clinical signs of nasal discharge, sneezing, coughing, 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. There was also common sign of difficulty in breathing which are similar to Chakraborty *et al.* (2014) and Prasanna *et al.* (2014). Common clinical signs of metritis were foul smelling vaginal discharge without pus frequently accompanied by fever, lethargy, a drop in milk production and lack of appetite these similar signs were also recorded by Rahman *et al.* (2008). Mastitis was characterized by the signs of clots and/or blood in the milk, reduced milk yield, hot, red, swollen, hard and painful udder which were similar to Housawi *et al.* (2008), Ribeiro *et al.* (2007). Infectious Keratoconjunctivitis (Pinkeye, Infectious ophthalmia) was revealed by clinical sign of clinical sign of conjunctivitis, lacrimation with varying degrees of corneal opacity, ulceration and blepharospasm, agreed with Kgotlele *et al.* (2013).

In the present study, macroscopically the PPR effected goats exhibited scab and crust formation on nasal mucosa, mucopurulent exudate from nasal opening to larynx, hyperaemia of trachea and bronchi, congestion and oedema of lungs. Haemorrhagic congested enteritis with gas accumulation. Haemorrhage and ulceration in ileo - caecal junction, colon and rectum forming "**zebra stripes**" and enlarged spleen, which are exactly resembled the lesions found by Chowdhury *et al.* (2014), Kgotlele *et al.* (2013) and Kumar *et al.*(2001).Grossly founded lesions in foot rot were reddened, moist and latterly horney tissues between the hooves in foot rot as same as Gashaw and Mersha

(2013).Under external parasitic Diseases, In scabies the gross lesions were characterized by the presence of small red papules and general erythema, thickening and wrinkling on the affected parts of skin with alopecia as similas as Thakuria *et al.* (2013) and Perrucci *et al.* (1996), in myiasis there were presence of large number of maggot at the point of wound opening with bleeding and exudation similarly founded by Tafti *et al.* (2012). From Internal parasitic Diseases, in fascioliasis the gross pathological changes of the liver in 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, similar lesions were founded by Okoye *et al.* (2015), Abraham and Jude (2014) and Talukde *et al.* (2010). Hydatid cysts 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, these necropsy findings were similar to Blutke *et al.* (2010). The most common mixed infectious disease mastitis were macroscopically characterized by congestion with haemorrhage and oozing turbid purulent bloody secretion during the period of lactation while few cases were fibrosed with pale discolouration which were previously manifested by Oludunsin *et al.* (2015).

Microsopic lesions of commonly affected endoparasites were studied here , among the internal pasatitis diseases, most commonly founded infection was fascioliasis which microscopically manifested by , 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 chirrhosis with mononeuclear inflammatory and lymphocytic proliferation throughout the liver debris of worm in the intrahepatic bile duct with thickened blood vessel due to fibrosis this lesions are more or less similar with the lesions mentioned by Okoye *et al.* (2015), Abraham and Jude (2014) and Borai *et al. (*2013). In schistosomiasis, 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 (Fig-29). In Spleen there was hemosiderosis throughout the spleenic parenchyma, these several lesions were previously mentioned by Habtamu *et al.* (2013), Kardman (2004), Seed and Nelson (1974) and Hussain (1971). In hydatidosis, 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 (Fig-34). 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 (Fig-36), and in the spleen there were scolex in the parenchyma with huge reactive cell infiltration with diffused edema in trabicule which are similar to the findings of Se´adawy. *et al.* (2012) Blutke *et al.* (2010).

CHAPTER VI

SUMMARY AND CONCLUSION

Goat rearing can play a vital role in poverty elevation, creation of self-employment opportunities in rural areas and animal protein supply which made additional income and generate the employment for household members, especially the unemployed family members like housewife, children and old persons. But various Infectious diseases now become a global problem and considered as a major obstacle in the health and product performance of livestock specially goats. These diseases occur mainly due to owner's incognizance of incidence of infectious diseases and also the preventing and controlling strategies of such diseases. Moreover, mismanagement and dependency only on natural feed sources and most importantly the infections results this situation and this is very alarming for the farmers.

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 fact is that the prevalence of diseases in a specific area depends on various factors like geo-climatic condition, biological barriers, immunization status, social awareness and mostly on the health status of the goats.

The present pathological investigation and prevalence study on to the infectious disease of goat in Sadar Upazilla in Dinajpur district of Bangladesh was conducted in the Department of Pathology and Parasitology, HSTU, Dinajpur, during the period from July 2014 to June 2015. A total of 2,013 goats (1269 form UVH and 870 from DVH) were recorded to visit both of these hospitals, from which prevalence of infectious diseases were made and The diseases were diagnosed on basis of clinical signs, owner's statement, general clinical examinations and laboratory diagnosis and pathological examination. The diagnosed diseases were mixed infectious diseases (46.06%), viral

diseases (28.93%), internal parasitic diseases (9.77%), external parasitic diseases (8.42%), bacterial diseases (3.00%), protozoal diseases (2.01%) and fungal diseases (1.83%). Laboratory investigation was conducted by faces examination and histopathological examination of organ collected from the endoparasite infected goats.

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, 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. The study indicates the great potentials for an improvement of goat production in rural Bangladesh. This research will be very helpful in formulating strategies for the betterment of goat production.

The prevalence of infectious diseases studied by various examinations but it was difficult to find the source of individual infection, characterization of causal agents and figure out the histopathological lesions of all the infectious diseases. Further studies should be done to 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.

REFERENCES

Abdullah FFJ, Radzuan NS, Tijjani A, Adamu L, Abba Y, Mohammed K, Osman AY, Roslim N, Awang DN, Saharee AA, Saad MZ, Haron AW, 2014. Stage II Keratoconjunctivitis in a Goat: A Case report, *IOSR Journal of Agriculture and Veterinary Science,* 7(1. IV): 16-18.

Abraham JT and Jude IB, 2014. Fascioliasis in Cattle and Goat Slaughtered at Calabar Abattoirs.*Journal of Biology, Agriculture and Healthcare,* 4 (18): 34-40.

Aguiar GMN, Simões SVD, Silva TR, Assis ACO, Medeiros JMA, Garino F and Correa F, 2011. Foot rot and Other Foot Diseases of Goat and Sheep in the Semiarid Region of Northeastern Brazil, *Pesq. Vet. Bras.*31 (10):879-884.

Ahmad K, Jamal SM, Ali Q and Hussain M, 2008. An outbreak of Peste des Petits Ruminants (PPR) in a goat flock in Okara, Pakistan, *Clinical Article, Pakistan Vetirany Journal,* 25(3): 146-148.

Alam MA, Amin MR, Paul TK, Saha TK, Rahman MK and Rizon MK, 2015. Prevalence of clinical diseases and disorders of goats at Upazila Livestock Development Center, Kapasia, Gazipur, Asian Journal of Medical and Biological Research, 1 (1): 47-52.

Ali MH, Bhuiyan MKJ and Alam MM, 2011. Retrospective Epidemiologic Study of Diseases in Ruminants in Khagrachari Hill Tract District of Bangladesh, *Bangladesh Journal of Veterinary Medicine,* 9 (2): 145 – 153.

Al-Qudah KM, Ahmad M, Al-Majali and Mohammad MO, 2008. A Study on Pathological and Microbiological Conditions in Goats in Slaughter houses in Jordan, *Asian Journal of Animal and Veterinary Advances,* 3: 269-275.

Amin MN, Hashim MA, Hossain MA, II Al-Sultan, 2013. Coenuruscerebralis infection (Gid disease) in Black Bengal goats; Effects on Certain Blood Values after Surgical Treatment, *Journal of Advanced Biomedical & Pathobiology Research,* 3(1):1-7.

Amin MR, 2015. Prevalence of Common Parasitic and Infectious Diseases of Goat at Babugonjupazilla, Barisal, Bangladesh, Asian Journal of Medical and Biological Research,.1 (3): 449-456.

Arafa MI and Fouad IA, 2008. Studies on Some Internal Parasites of Goats in Assiut Governorate Especially which Affecting Liver, *Assiut University Bulletin for Environmental Research,* 11 (1): 57-72.

Aroora and Iyer, 1968. Studies on the Pathology of Ovine and Caprine Livers owing to the *Schistosoma spp*. Infection, *Indian Journal of Veterinary Pathology*, 77: 377-385.

Asghar A, Hassanien O, Alsadi A, Feda H and Fathi S, 2011. Prevalence of Scabies Diagnosed in Sheep and Goats during Hajj Season in Makkah, *Journal of Agricultural and Veterinary Sciences*, 4(1): 37-43.

Aziz F, Tasawar Z and Lashari HM, 2013. Prevalence of *Sarcoptes scabiei var.caprae* in Goats of Dera Ghazi Khan, Punjab, Pakistan, *International Journal of Current Engineering and Technology,* 3 (4): 1327-1329..

BBS, 2015. Subject wise Report, Gross Domestic Products, GDP (2014-1015), Bangladesh Bureau Statistics, Ministry of Planning, and Dhaka.

Blutke A, Hamel D, Hu¨ ttner M, Gehlen H, Romig T, Pfister K, Hermanns W, 2010. Cystic Echinococcosis due to *Echinococcus equinus* in a horse from southern Germany, *Journal of Veterinary Diagnosis and Investion,* 22: 458–462.

Chakraborty S, Kumar A, Tiwari R, Rahal A, Malik Y, Dhama K, Pal A, and Prasad M, 2014. Advances in Diagnosis of Respiratory Diseases of Small Ruminants, *Veterinary Medicine International,* Article ID 508304: 1-16.

Chowdhury EH, Bhuiyan AR, Rahman MM, Siddique MSA and Islam MR, 2014. Natural Peste des Petits Ruminants Virus Infection in Black Bengal goats: Virological, Pathological and Immunohistochemical investigation, *BMC Veterinary Research,* 10 (1): 263-275

Das BC and Hashim MA, 1996. Studies on surgical affections in calves. *Bangladesh Veterinary Journal,* 30: 53-57.

DLS, 2009. Annual Report of Directorate of Livestock Services (2008-2009), Bangladesh.

Egerton JR, Ghimire SC, Dhungyel OP, Shrestha HK, Joshi HD, Joshi BR, Abbott KA, Kristo C, 2010. Eradication of virulent foot rot from sheep and goats in an endemic area of Nepal and an evaluation of specific vaccination, *Article in the Veterinary Record,* 151(10): 290-305.

El-Hallawany HA and Abdel-Aziz MZ, 2012. Clinico-histopathological Studies on the Correlation between Some Parasitic Infestation on Liver and Ovarian Efficiency in Small Ruminants, *Journal of Reproduction and Infertility* 3 (3): 67-76.

Ershaduzzaman M, Rahman MM, Roy BK and Chowdhury SA, 2007. Studies On The Diseases and Mortality Pattern of Goats under Farm Conditions and Some

Factors Affecting Mortality and Survival Rates in Black Bengal Kids, *Bangladesh Journal of Veterinary Medicine*, 5 (1 & 2): 71–76.

Esmaeilnejad B, Tavassoli M, Rezaei SA, Naghadeh BD, Mardani K , Golabi M, Arjmand J, Kazemnia A, Jalilzadeh G, 2014. Determination of Prevalence and Risk Factors of Infection with *Babesia ovis*in Small Ruminants from West Azerbaijan Province, Iran by Polymerase Chain Reaction. *Journal of Arthropod-Borne Diseases*, 9(2): 246–252.

FAO, 2003. FAO Production Yearbook, Food and Agricultural Organization of the United Nations, Rome, Italy, 57: 147- 149.

Ghebremariam MK, Debesai MG, Sanjay D and Basharat AP, 2014. Hydatidosis as a Major Cause of Liver Condemnation among Parasitic Diseases in Goats and Sheep in Keren Slaughterhouse, Anseba zone, Eritrea, *Veterinary World*, 7: 266-270.

Giadinis ND, Farmaki R, Papaioannou N, Papadopoulos E, Karatzias H and Koutinas AF, 2011. Moxidectin Efficacy in a Goat Herd with Chronic and Generalized Sarcoptic Mange,*Research Veterinary Medicine International*, Article ID 476348:1-4.

Habtamu A, Negash T, Sirak A and Chanie M, 2013. Pathology of Natural Infections of *Schistosomabovis*in Cattle in Ethiopia.*Global Veterinaria*, 11(2): 243-247.

Hassan AA, Ibrahim AM, Mohamed RH, Aden HH, 2013. Preliminary Assessment of Goat Piroplasmosis in Benadir Region, Somalia.*Open Journal of Veterinary Medicine*, 3: 273-276.

Hassan MM, Hoque MA, Islam SKM, Khan SA, Roy K and Banu Q, 2011. A prevalence of parasites in black bengal goats in Chittagong, Bangladesh, International Journal of Livestock Production, 2 (4): 40-44.

Hendrix CM and Robinson E, 2006. Diagnostic Parasitology for Veterinary Technicians, Mosby Inc. and affiliated of Elsevier Inc, China.

Hoque MS, 1996. Clinical prevalence and findings of diseases and disorders in cattle and goats at the Central Veterinary Hospital, Dhaka. MS Thesis. Department of Medicine, Bangladesh Agricultural University, Mymensingh.

Housawi F, Elzein ElTE, Al-Naeem AM, Gameel A and Homaida AQ, 2008. Induced Udder Orf Infection in Sheep and Goats, VeterinarskiArhiv 78 (3): 217-225.

Husain SS, 1993. A study on the Productive Performance and Genetic Potential of Black Bengal Goats, Ph.D, Thesis, Bangladesh Agricultural University, Mymensingh.

Hussain MJ, 1971. The pathology of experimental Fascioliasis in calves, Journal of Comparative Pathology. 77 (4): 377-386.

Ijaz M, Rehman A, Ali MM, Umair M, Khalid S, Mehmood K and Hanif A, 2013. Clinico-Epidemiology and Therapeutical Trials on Babesiosis in Sheep and Goats in Lahore, Pakistan, *The Journal of Animal & Plant Sciences*, 23 (2): 666-669.

Iqbal A, Tripathi AK, Peer PU, Wazir VS, 2011. Foot Rot- An Emerging Issue in Sheep Husbandry. *International Journal of Livestock Research,* 1(1): 5-16.

Islam MA and Rahman AKMA, 2011 a. Bacterial Pathogens and Risk Factors Associated with Mastitis in Black Bengal Goats In Bangladesh. *Bangladesh Journal of Veterinary Medicine* , 9(2): 155-159.

Jackson PGG, Cockcroft PD, 2002. Clinical examination of farm animals. Blackwell Science Ltd., Blackwell Publishing Company, Oxford, United Kingdom, 1-112.

Juyena NS, Tapon MAH, Ferdousy RN, Paul S and Alam MM, 2013. A Retrospective Study on Occurrence of Myiasis in Ruminants, Progress. Agric.24 (1 & 2): 101 – 106.

Kahn CM and Line S, 2011. The Merck Veterinary Manual, 10th Edition Merck Sharp &Dohme Corp., a subsidiary of Mer-ck& Co., Inc. Whitehouse Station NJ, USA, 501-524.

Kalaiselvi G, Daniel N, Chandran J and Vidhya M, 2014. Ring Worm Infection in a Goat- a Clinical Case Report, Indian Journal of Veterinary & Animal Science, 43(5) : 386 – 389.

Kashem MA, Hossain MA, Ahmed SSU, Halim MA, 2011. Prevalence of Diseases, Morbidity and Mortality of Black Bengal Goats under Different Management Systems in Bangladesh, *Rajshahi University Journal of Zoology*, 30(1): 1-4.

Kgotlele T, Macha ES, Kasanga CJ, Kusiluka LJM, Karimuribo ED, Doorsselaere JV, Wensman JJ, Munir M and Misinzo G, 2013. Partial Genetic Characterization of Peste des Petits Ruminants Virus from Goats in Northern and Eastern Tanzania, *Transboundary and Emerging Diseases*, 61(1): 56-62.

Khan MA, Hussain SN, Bahadar S, Ali A and Shah IA, 2008. An outbreak of peste des petits ruminants (ppr) in goats in district Chitral, N.W.F.P., Pakistan, *Journal of Agricultural and Biological Science*, 3(2): 19-22.

Kheirandish R, Fard SRN and ZY, 2014. Prevalence and Pathology of Coccidiosis in Goats in southeastern Iran, *Journal of Parasitic Diseases*, 38 (1): 27–31.

Kinley GE, Schmitt CW, and Devalle JS, 2013. A Case of Contagious Ecthyma (Orf Virus) in a Nonmanipulated Laboratory Dorset Sheep (*Ovisaries*),*Hindawi Publishing CorporationCase Reports in Veterinary Medicine*,Article ID 210854, 5 pages.

Krishna M, Gole SG Gole, GN, 2015. Hydatid Cyst in Lung and Liver, *Journal of Evolution of Medicine and Dent*, 4(72): 12542-12547.

Kuchai JA, Chishti MZ. Tak H and Lone BA, 2012. Faecal Examinations of Pashmina Goats (*Capra siberica*) of Ladakh for Nematode Infections, *Global Journal of Science Frontier Research Biological Sciences*, 12 (4:1): 37-41.

Luna LG, 1968. Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology, 3rd Edition.McGrow Hill Book Co. New York: 134-140.

Mahdi AA, Al-Naqshabendy AA, Haddel BT, 2015. A Study of Some Pathological Lesions in The Lung of Sheep and Duhok Abattoir, *Bas. Journal of Veterinary Research*, 14(2): 256-277.

Marimuthu M, Firdaus F, Abdullah J, Mohammed K, Adamu L, Tijjani A, Abba Y, Sadiq MA, Ting L Y, Saharee AA and Haron AW, 2015. Comparative

Treatment Approach for Sarcoptesand PsoroptesMite Infestation in a Boer Cross,*Journal of Advanced Veterinary and Animal Research.*, 2(1): 84-88.

Metwally AEEl and Hanaa AE, 2008. Mastitis Pathogens in Relation to Histopathological Changes in Buffalo Udder Tissues and Supramammary Lymphnodes. *Egyptian Journal of Comparative Pathology & Clinical Pathology*, 21 (4): 190 – 208.

Mohanta UK, Anisuzzaman, T Farjana, PM Das, S Majumderand MMH Mondal, 2007. Prevalence, Population Dynamics and Pathological Effects of Intestinal Helminths in Black Bengal Goats, *Bangladesh Journal of Veterinary Medicine*, 5 (1 & 2): 63–69.

Moon DS, 2014. Prevalence of Helminth Infections in Goat at Mymensingh SadarUpazila, MS thesis, Department of Parasitology, Bangladesh Agricultural University Mymensingh.

Nath TC, Bhuiyan MJU, Mamun MA, Datta R, Chowdhury SK, Hossain M, Alam MS, 2014. Common Infectious Diseases of Goats in Chittagong District of Bangladesh, *International Journal of Scientific Research in Agricultural Sciences*, 1(3): 43-49.

Noman MA, Shaikat A, Nath B, Shil S and Hossain M, 2011. Incidence and modulating effects of environmental factors on infectious diseases of Black Bengal goat in Cox's Bazar district of Bangladesh, *YYUVeterinerFakultiDergisi*, 22 (3): 163-167.

Nonga HE, Mellau LSB and Karimuribo ED, 2010. A Slaughter House Survey of Liver Lesions in Slaughtered Cattle, Sheep and Goats at Arusha, Tanzania.*Research. J.V.S*, 3 (3): 179-188.

Nyangiwe N & Horak IG, 2007. Goats as alternative hosts of cattle ticks. *Onderstepoort Journal of Veterinary Research*, 74:1–7.

Okoye IC, Egbu FMI, Ubachukwu PO and, Nduka OR, 2015. Liver Histopathology in Bovine Fascioliasis, *African Journal of Biotechnology*, 14(33): 2576-2582.

Oludunsin FO, Ayinde SN, God OET, Olaiya OO, Oladele OP. 2015. Sarcoptic Mange Infestation in West Africa Dwarf Goat Herd in Ibadan, South West Nigeria, *World Journal of Agricultural Research,* 3 (1): 24-27

Oniye SJ, Adebote DA and Ahunanya CB, 2006. Observations on *Oestrus ovis* L. (Diptera: Oestridae) Myiasis in the Nasal Cavities and Sinuses of the Domestic Sheep (*Ovis aries*) in Zaria, Northern Nigeria, *International Journal of Zoological Research*, 2: 178-185.

Onoja II, Malachy P, Mshelia WP, Okaiyeto SO, Danbirni S and Kwanashie G, 2013. Prevalence of Babesiosis in Cattle and Goats at Zaria Abattoir, Nigeria, *Journal of Veterinary Advances*, 3 (7): 211-214.

OwhoeliO, Elele K and Gboeloh LB, 2014. Prevalence of Gastrointestinal Helminths in Exotic and Indigenous Goats Slaughtered in Selected Abattoirs in Port Harcourt, South-South, Nigeria, *Chinese Journal of Biology*, Article ID 435913: 1-8.

Parvez MA, Faruque MR, Sutradhar BC, Rahman MM, Mannan A and Khatun R, 2014. Clinical Diseases and Manifestations of Goats and Cattle Recorded at Teaching Veterinary Hospital in Chittagong Veterinary and Animal Sciences University, *Bangladesh Journal of Veterinary Medicine*, 12 (1): 73-81.

Perrucci S, **Cascella A**, **Bencini E**, **Macchioni F**, **1996.** Clinical and etiological aspects of goat ear mite infestations in Tuscany. *Parassitologia.*, 38(3):549-553.

Peter ID, Dauda Y, Thlama PB, Ndahi JN, Adziga HH, Stephen J, Mustapha AR, 2015. A Retrospective Study of Small Ruminant Diseases Identified at the State Veterinary Hospital Maiduguri, Nigeria, *Journal of Animal Health and Production*, 3 (4): 88-93.

Prasanna KS, 2014. Pathological Lesions of Aspiration Pneumonia in Malabari Goats WithMoneiziasis, *Indian Journal of Applied Research*, 4 (9): 542-543.

Rahman MA, Islam MA, Rahman MA, Talukder AK, Parvin MS and Islam MT, 2012. Clinical Diseases of Ruminants Recorded at The Patuakhali Science and Technology University Veterinary Clinic, *Bangladesh Journal of Veterinary Medicine*, 10 (1&2): 63-73.

Rahman MA, Shadmin I, Noor M, Parvin R, Chowdhury EH and Islam MR, 2011. Peste des Petits Ruminants virus infection of goats in Bangladesh: Pathological investigation, molecular detection and isolation of the virus, *The Bangladesh Veterinarian*, 28 (1): 1 - 7

Rahman MH, Chowdhury EH, Saha SS, Islam A and Alam MGS, 2008. Abattoir Study of Reproductive Diseases in Goats, *The Bangladesh Veterinarian*, 25 (2): 88-90.

Rahman MS, Islam MS, Sultana MS and Kabir F, 2015. Study on Prevalence of *Peste Des Petits Ruminants* (PPR) in Goats, *Bangladesh Research Publications Journal*, 11, (1): 54-58.

Ribeiro MG, Lara GHB, Bicudo SD, Souza AVG, Salerno T, Siqueira AK and Geraldo JS, 2007. An Unusual Gangrenous Goat Mastitis caused by *Staphylococcus aureus*, *Clostridium perfringens* and *Escherichia coli* co–Infection, *Arquivo Brasileiro de Medicina Veterinária e Zootecnia*., 59 (3): 810-812.

Rony SA, Mondal MMH, Islam MA and Begum N, 2010. Prevalence of Ectoparasites in Goat at Gazipur in Bangladesh, *International Journal of Biological Research*, 2 (9): 19-24.

Salih KA and Abass KS, 2014. Anatomical and Histological Study of Glands in Uterine cervix of Black Goat (*Capra hircus*), Journal of Natural Sciences Research, 4 (3): 94-97.

Samad MA, 1988. Veterinary Clinicial Guide. 2nd edn., Lyric-Epic Prokasoni, BAU Campus, Mymensingh, pp. 572-580.

Samuel WM, Chalmers GA, Stelfox JG, Loewen A, and Thomsen JJ, 2004. Contagious Ecthyma in Bighorn Sheep and Mountain Goat in Western Canada, *Journal of Wildlife Diseases*, 11: 26-31.

Se´adawy MAHA and Kaled MJAA, 2012. Gross and Histological Comparison of Hydatid Cyst Infection in Livers of Sheep and Cows, AL-Qadisiya, *Journal of Veterinary Medical Science*, 11 (2): 1-11

Seed and Nelson, 1974. The Experimental Schistosomiasis in Sheep, *Bulletin de Office International des Epizootics*, 56:1002-1004.

Selim M, Sen MM and Rahman A, 1997. An abattoir survey on the liver diseases of black bengal goats. *Bangladesh Veterinary Journal*, 31: 113-114.

Seyoum Z, Tadesse T and Addisu A, 2015. Ectoparasites Prevalence in Small Ruminants in and around Sekela, Amhara Regional State, Northwest Ethiopia, *Journal* of *Veterinary Medicine and Animal Health*, 6(1): 1-6.

Silva LMR, Vila-Viçosa1 MJM, Nunes T, Taubert A, Hermosilla C, Cortes HCE, 2014. *Eimeria* Infections in Goats in Southern Portugal, *Brazilian Journal of Veterinary Parasitology., Jaboticabal*, 23(2): 280-286.

Sohair, Eman BI and Nasr M, 2009. Histopathological and Bacteriological Studies on Livers Affected with Fascioliasis in Cattle, *Egyptian Journal of Comparative Pathology and Clinical Pathology*, 22 (1):19-45.

Soulsby EJL, 1986. Helminth, arthropod and protozoa of domesticated animals, Bailliere and Tindall, London, 809-811.

Soundararajan C, Latha BR and Pandian SS, 2014. Prevalence of Tick Infestation in Goats under Different System of Management, *International Journal of Agricultural Sciences and Veterinary Medicine*,2 (3): 178-180.

Stancheva M, Pencheva P and Alexandrov MT, 2010. Some Pathological Features of Lungs from Domestic and Wild Ruminants with Single and Mixed Protostrongylid Infections, *Veterinary Medicine International Volume,* Article ID 741062:1-9.

Tafti AK, 2012. Morphophologic Characteristics of Myiasis Caused by *Przhevalskianas lenus* Larvae in Goats. *VeterinarskiArhiv* , 82 (1): 25-33.

Taghipour M, Babamahmoodi F, Arashnia P and Taghipour S, 2015. Orf Virus Infection in Human (Echtyma Contagiosum): A Report of Eight Cases in the North of Iran, International Journal of Medical Investion, 4(1); 183-186.

Talukder S, Bhuiyan MJ, Hossain MM, Uddin MM, Paul S and Howlader MMR, 2010. Pathological Investigation of Liver Fluke Infection of Slaughtered Black

Bengal Goat in A Selected Area of Bangladesh *Bangladesh Journal of Veterinary Medicine*, 8(1): 35 – 40.

Thakuria P, Kalita DN, Phukan A, Dutta TC, Neog R, 2013. Clinical Management of Caprine Scabies, *IntasPolivet*, 14 (2):288- 289**.**

Urquhart GM, Armour J, Duncan JL, Dunn AM and Jennings FW, 1996. Veterinary Parasitology. 2nd ed. Ox- ford, UK: *Blackwell Science* Ltd. 1996*:* 224-234.

Zahur AB, Ullah A, Irshad H, Atif A, Ullah RW, Jahangir M, Afzal M, Khan SA and Salaria SM, **2014.** Epidemiological Analysis of Peste des Petits Ruminants (PPR) Outbreaks in Pakistan. *Journal of Biosciences and Medicines*, 2: 18-26.

Zeru F, Bedada H, Seid MGA, Gebregergious A, 2015. Epidemiology of Major Small Ruminant Ectoparasites and Effectiveness of the Control Approaches Employed in Selected Pastoral Districts of Afar, Northeastern Ethiopia, *Journal of Biology, Agriculture and Healthcare*, 5 (14): 63-72.