International Journal of Innovation and Applied Studies
ISSN 2028-9324 Vol. 32 No. 1 Feb. 2021, pp. 144-155

http://www.ijias.issr-journals.org/

Investigation of different parasites of farmed pigeons at Dinajpur Sadar Upazila

Md. Gausur Rahman[1], S.M. Harun-ur-Rashid[2], Md. Haydar Ali[3], and Md. Golam Azam[3]

[1]Department of Pathology and Parasitology, Hajee Mohammed Danesh Science and Technology University, Dinajpur, Bangladesh

[2]Professor, Department of Pathology and Parasitology, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh

[3]Assistant Professor, Department of Pathology and Parasitology, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh

ABSTRACT: A cross sectional study was conducted to investigate the different parasites in farmed pigeon at sadar upazila of Dinajpur, Bangladesh during January to June, 2017. A total of 122 pigeons (39 young and 83 adults in which 45 male and 77 female) from different farms were examined by faecal, oral and blood sample examination and postmortem examination for histopathological study. The investigation expressed that the highest overall prevalence was ectoparasites 107 (87.70%) followed by helminthes 96 (78.69%) and protozoa 71 (58.20%). In this study, the frequency of *Echinostoma* sp., *Raillietina* sp., *Ascaridia* sp., *Capillaria* sp., O*rnithostrongylus* sp., *Eimeria* sp., *Trichomonas* sp., *Haemoproteus* sp., C*olumbicola columbae, Menopon* sp.and *Lipeurus* sp. were found to be 24 (19.67%), 46 (37.67%), 51 (41.80%), 38 (31.15%), 15 (12.30%), 45 (36.89%), 47 (38.52%), 39 (31.97%), 96 (78.67%), 55 (45.08%) and 75 (61.48%) respectively. The age and sex related prevalence of helminth revealed that adults 68 (81.93%) and females 62 (80.52%) were more susceptible (P>0.05) than young 28 (71.79%) and male 34 (75.56%). Further, youngs 25 (64.10%) and female 50 (64.94%) were more prone (P>0.05) to protozoa than adults 46 (55.42%) and male 21 (46.67%). Association of age and sex with ectoparasites indicated that the prevalence of ectoparasites was significantly (P<0.001) higher in adult 80 (96.39%) than young 27 (69.23%) and also significantly (P<0.05) higher in female 50 (64.94%) than male 21 (46.67%) pigeons. The results indicate that pigeons of this area are very much susceptible to different endo and ectoparasites which cause great economic loss of the farmer.

KEYWORDS: investigation, parasite, farmed, pigeons.

1 INTRODUCTION

Bangladesh is a developing country where poultry industry is a rising sector. It plays an important role in the rural economy (Nath *et al*., 2014). This poultry sector employs about 5 million people & has experienced a long-term growth rate of about 4.50%, which is highest in the economy (BLRI report, 2009).Poultry producers are searching for some substitute of meat, which will come in the form of pigeon meat to contribute towards the increase in Gross Domestic Production (GDP) through livestock sector. Pigeon rearing is an integral part of many farming systems and increasing day by day in Bangladesh. In Bangladesh, pigeon is used for meat production and ornamental purposes. It provides one of the main sources of income for the farmers of Bangladesh. Pigeons are probably the most common nuisance bird. They have adapted to life in the city and they seem to be everywhere in urban environments (Bahrami *et al*., 2012).

Usually, the domestic pigeons (*Columba livia*) are highly susceptible to infection with a large number of internal parasites and cause heavy economic losses in the form of related growth, decreased production. They feed on the wide range of food items including grains, slugs, earthworms and insects that in many instances may carry infective stages of intestinal parasites.

Corresponding Author: Md. Gausur Rahman

Several health problems can affect pigeons but parasitic infections play a major role. They constitute a major source of infection and transmission of diseases (Marques *et al.,* 2007).

The close contact of pigeons with other domestic birds increases risk of parasitic infestation in birds and carries a possible zoonotic potential for transmission of diseases to human beings (Marques *et al*., 2007 and Sari *et al*., 2008). The diseases are mainly spread through faecal dust from cages contaminated with dry droppings and urine (Marques *et al*., 2007).

The effects of parasitism on birds are often severe, including retarded growth, low egg production and susceptibility to other infections (Dranzoa, 1999).Wide ranges of helminthes are found in the gastrointestinal tract of pigeons, the majority of which are responsible for clinical and subclinical parasitism. Infection results in weight loss, anemia, retarded growth, fertility disturbance, emaciation, gut epithelium complications and reduction in immune responses of host against various diseases (Urquhart *et al*., 2000). Such complications in young pigeons eventually lead to death (Basit *et al*., 2006). Ectoparasites are regarded as the basic causes of retardation in growth, lowered vitality and poor conditions of the birds (Pirali-Kheirabadi *et al*., 2016).

The prevalence and intensity of parasitic infestations may be influenced by a number of epidemiological factors including host factors such as age, sex and breed and environmental factors such as climatic conditions (Nadeem *et al*., 2007).

In view of above facts, it is assumed that parasitic disease is one of the major problems for the pigeons, but no attention has been paid to investigate the parasitic diseases of farmed pigeon in Bangladesh. Therefore, the present study was undertaken with a view to fulfilling the following objectives:

1. To investigate and identify different parasites of pigeon.
2. To detect the prevalence of parasites in relation to age and sex of pigeons.
3. To study the gross and histopathology of intestine collected from infected pigeon.

2 Materials And Methods

2.1 Study Area And Duration

The study was conducted for a period of six months starting from January to June'2017. During this investigation, a total of 122 birds (83 adult and 39 young in which 45 male and 77 female) were considered from different farms of Sadar upazila of Dinajpur district, Bangladesh.

2.2 Selection And Examination Of Bird

A questionnaire was designed to collect the objectives oriented data from each bird by the help of the owner or by physical examination. The birds were taken out of the cages and restrained as described by Stone (1982). Age was determined by examining iris color and unmolted feathers and the presence of cloacal sex character and glandular bursa as described by Sol *et al*. (2000) and Silovsky *et al*. (1968) respectively. Sex was determined by general appearance, movement and behavior as described by Kabir (2014). According to age pigeons are divided into two groups: young (1 to 3 months) and adult (>3 months). Examinations of each pigeon for ectoparasites, faecal and blood sampling were made in that order. All the samples were brought to the Parasitology laboratory of Hajee Mohammad Danesh Science and Technology University, Dinajpur.

2.3 Collection And Examination Of Faeces

Faecal samples were taken into a dry vial at the cloacal orifice by gently squeezing the abdomen and put into different labeled sample bottle containing 10% formalin. Faeces were examined by gross examination, three different types of qualitative tests; namely direct smear, flotation and sedimentation techniques were used to examine the fecal samples to identify the morphological features of eggs, cyst, oocysts (Hendrin and Robinson, 2006; Soulsby, 1982).

2.4 Collection And Staining Of Blood And Identification Of Protozoa

Blood samples were collected from the wing vein with the help of syringe and needle and taken in a vial with sodium salt of EDTA and kept in refrigerator. The thin smear was made immediately after the collection of blood. The smears were then air dried, fixed in methanol and stained with Giemsa's stain as per standard method (Cable, 1957). The slides were examined under microscope in higher magnification (40X and 100X) for the detection of blood protozoa. Identification was based on the morphology as described by Levine (1985), Springer (1997) and Soulsby (1982).

2.5 Examination Of Oral Swab For Trichomonas Gallinae

Fresh scraping from oral mucosa or oral, esophageal swab or swab from crop were taken and examined for the presence of *Trichomonas* gallinae, it was done by preparation of wet mount and confirmed by the motile trophozoites with pear-shaped parasite (McDougald, 2003).

2.6 Collection And Examination Of Ectoparasites

Each bird was carefully examined. The wings were fully stretched and examined, and all over the body, the feathers were separated so as to expose the skin. The ectoparasites were collected and preserved in 70% alcohol for subsequent processing and examination at the laboratory. Finally, the ectoparasites were identified according to Soulsby (1982) and Cheesbrough (1990).

2.7 Postmortem And Histopathological Examination

Postmortem examination of clinically sick and dead pigeons was performed as described by Fowler (1990). Intestines were collected and fixed in 10% buffered neutral formalin for histopathological studies. Formalin fixed tissue samples were processed, embedded in paraffin wax, sectioned and stained with hematoxylin and eosin as per standard method (Luna, 1968).

2.8 Statistical Analysis

The data were recorded and analyzed statistically by using statistical software 'SPSS' (version 20). Chi–Square Test were performed and the results were expressed in percentage with P–value and significance was determined when $P<0.05$.The mean intensity was calculated and analyzed by F-variance test. Odds ratio was calculated according to the formula Schesselman (1982).

Fig. 1. Collection of faeces (A, B), oral swab (C) and ectoparasites (D)

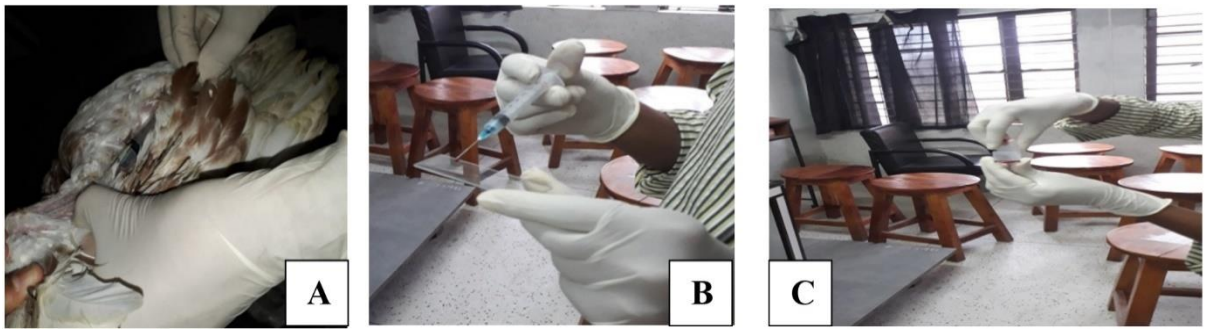

Fig. 2. Collection of blood from wing vein (A) and preparation of blood smear (B, C)

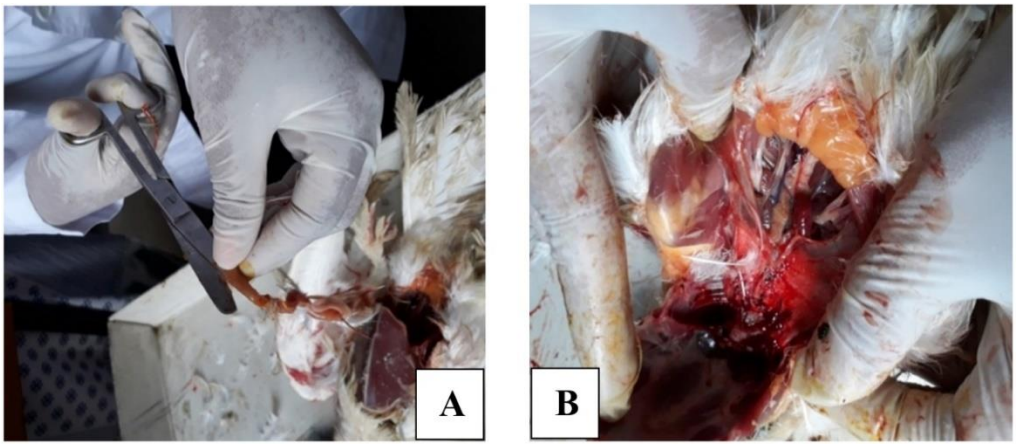

Fig. 3. Postmortem examination and collection of sample (A, B)

3 RESULTS

3.1 OVERALL PREVALENCE OF PARASITES IN FARMED PIGEON

In this study, a total number of 122 farmed pigeons were examined of which 96 (78.69%), 71 (58.20%) and 107 (87.70%) were infected with different species of helminth, protozoa and ectoparasites respectively (Table 1). The present study indicated that the higher prevalence rate of helminthes was *Ascaridia* sp. (41.80%) followed by *Raillietina* sp. (37.67%), *Capillaria* sp. (31.15%), *Echinostoma* sp. (19.67%) and *Ornithostrongylus* sp. (12.3%).The protozoan parasites found in the table 1 were *Eimeria* sp. (36.89%), *Trichomonas* sp. (38.52%) and *Haemoproteus* sp. (31.97%). During this investigation, 3 species of ectoparasites were identified as 78.69%, 45.08% and 61.48% for *Columbicola columbae, Menopon* sp.and *Lipeurus* sp.The prevalence of *Columbicola columbae* was found highest among the ectoparasites.

Table 1. Prevalence of parasites in farmed pigeon at Dinajpur sadar (N=122)

Name of parasites	No. of infected pigeon	Prevalence (%)
Helminthes		
Overall	**96**	**78.69**
Echinostoma sp.	24	19.67
Raillietina sp.	46	37.67
Ascaridia sp.	51	41.80
Capillaria sp.	38	31.15
Ornithostrongylus sp.	15	12.30
Protozoa		
Overall	**71**	**58.20**
Eimeria sp.	45	36.89
Trichomonas sp.	47	38.52
Haemoproteus sp.	39	31.97
Ectoparasites		
Overall	**107**	**87.70**
Columbicola columbae	96	78.69
Menopon sp.	55	45.08
Lipeurus sp.	75	61.48

N= Number of bird examined

3.2 AGE RELATED PREVALENCE OF PARASITES IN FARMED PIGEON

The overall prevalence of helminth parasites was higher in adult (81.93%) than young (71.79%) pigeon but the difference was not significant. The odd ratio 1.8 implies that adults are 1.8 times more susceptible to helminthes than young. The prevalence of *Echinostoma* sp., *Raillietina* sp.*, Ascaridia* sp.*, Capillaria* sp.*, Ornithostrongylus* sp. in young and adult was 15.38% and 21.69%, 10.26% and 50.60%, 46.15% and 39.76%, 25.64% and 33.73%, 10.26% and 13.25% respectively (Table 2). The prevalence rate of *Raillietina* sp. was significantly (P<0.001) higher in adult than young pigeons but the others were not significant (P>0.05) and *Ascaridia* sp. was found higher in young than adult pigeons.

The higher prevalence of protozoan parasites was found in young (64.10%) than adult (55.42%) pigeon but there was no significant difference between age groups. The odd ratio 1.4 implies that youngs are 1.4 times more susceptible to protozoa than adults. The prevalence of *Eimeria* sp.was significantly (P<0.05) higher in young (51.28%) than adult (30.12%) pigeon. In case of *Trichomonas* sp.*,* the prevalence was higherin young (48.71%) in compare to adult (33.73%) pigeons. On the other hand, H*aemoproteus* sp. was higher in adult (34.94%) than young (25.64%) pigeons.

The present study revealed that the overall prevalence of ectoparasites was significantly (P<0.001) higher in adult (96.39%) than young (69.23%) pigeons. The odd ratio 11.8 implies that adults are 11.8 times more susceptible to ectoparasites than young. The prevalence rate of *Columbicola columbae*, *Menopon* sp., *Lipeurus* sp.in young and adult was 48.72% and 92.39%, 30.77% and 51.81%, 35.90% and 73.49% respectively (Table 2) and all ectoparasites were significantly higher in adult than young pigeons.

Table 2. Age related prevalence of parasites in farmed pigeon at Dinajpur sadar

Name of parasites	Age		P value	Odd ratio
	Young (N=39) Positive no. (Prevalence)	Adult (N=83) Positive no. (Prevalence)		
Helminthes				
Overall	**28 (71.79%)**	**68 (81.93%)**	**0.20** (NS)	**Adult vs Young =1.8**
Echinostoma sp.	6 (15.38%)	18 (21.69%)	0.41 (NS)	
Raillietina sp.	4 (10.26%)	42 (50.60%)	<0.001***	
Ascaridia sp.	18 (46.15%)	33 (39.76%)	0.50 (NS)	
Capillaria sp.	10 (25.64%)	28 (33.73%)	0.37 (NS)	
Ornithostrongylus sp.	4 (10.26%)	11 (13.25%)	0.64 (NS)	
Protozoa				
Overall	**25 (64.10%)**	**46 (55.42%)**	**0.37** (NS)	**Young vs Adult =1.4**
Eimeria sp.	20 (51.28%)	25 (30.12%)	0.024*	
Trichomonas sp.	19 (48.71%)	28 (33.73%)	0.11 (NS)	
Haemoproteus sp.	10 (25.64%)	33 (34.94%)	0.30 (NS)	
Ectoparasites				
Overall	**27 (69.23%)**	**80 (96.39%)**	**<0.001**	**Adult vs Young =11.8**
Columbicola columbae	19 (48.72%)	77 (92.77%)	<0.001***	
Menopon sp.	12 (30.77%)	43 (51.81%)	0.03*	
Lipeurus sp.	14 (35.90%)	61 (73.49%)	<0.001***	

*N= Number of bird examined, *means significant at 5% level of significance (P< 0.05), *** (P<0.001) means statistically highly significant, NS means statistically Not Significant.*

3.3 SEX RELATED PREVALENCE OF PARASITES IN FARMED PIGEON

The present study indicated that female pigeons (80.52%) were more susceptible to helminth parasites than male pigeons (75.56%) but it was not statistically significant (P>0.05).The odd ratio 1.3 implies that females were 1.3 times more susceptible than male pigeon. The prevalence percentage of *Echinostoma* sp., *Raillietina sp., Ascaridia* sp.*, Capillaria* sp.*, Ornithostrongylus* sp.in male was 8.89%, 33.33%, 35.56%, 24.44% and4.44% respectively and in female was 25.97%, 40.26%, 45.46%, 35.04% and

16.88% respectively (Table 3). The prevalence of *Echinostoma* sp. and *Ornithostrongylus* sp. in female were statistically higher than male but others were not statistically significant.

During this investigation, it was found that females (64.94%) were higher in prevalence of protozoa than males (46.67%).The odd ratio 2.1 implies that females were 2.1 times more susceptible than male pigeon. The prevalence of *Eimeria* sp., *Trichomonas* sp. and *Haemoproteus* sp. in male was 24.44%, 31.11% and 24.44% respectively and in female was 44.16%, 42.86% and 36.36% respectively (Table 3). There was significant (P<0.05) sex related difference seen in the prevalence of *Eimeria* sp..

The present findings showed that the prevalence of ectoparasites was significantly (P<0.05) higher in female (93.50%) than male (77.78%). The odd ratio 4.1 implies that females were 4.1 times more susceptible than male pigeon. The prevalence of *Columbicola columbae*, *Menopon* sp.and *Lipeurus* sp. in male was 64.44%, 37.78%% and 46.67% respectively and in female was 87.01%, 49.35% and 70.13%respectively (Table 3). There was no significant (P>0.05) sex related difference seen in the prevalence of *Menopon* sp. but in case of *Columbicola columbae* and *Lipeurus* sp. females were significantly higher in compare to male pigeons.

Table 3. Sex related prevalence of parasites in farmed pigeon at Dinajpur sadar

Name of parasites	Sex		P value	Odd ratio
	Male (N=45) No. positive (Prevalence)	Female (N=77) No. positive (Prevalence)		
Helminthes				
Overall	**34 (75.56%)**	**62 (80.52%)**	**0.52 (NS)**	**Female vs Male=1.3**
Echinostoma sp.	4 (8.89%)	20 (25.97%)	0.02*	
Raillietina sp.	15 (33.33%)	31 (40.26%)	0.45 (NS)	
Ascaridia sp.	16 (35.56%)	35 (45.46%)	0.29 (NS)	
Capillaria sp.	11 (24.44%)	27 (35.04%)	0.22 (NS)	
Ornithostrongylus sp.	2 (4.44%)	13 (16.88%)	0.04*	
Protozoa				
Overall	**21 (46.67%)**	**50 (64.94%)**	**0.048***	**Female vs Male=2.1**
Eimeria sp.	11 (24.44%)	34 (44.16%)	0.029*	
Trichomonas sp.	14 (31.11%)	33 (42.86%)	0.20 (NS)	
Haemoproteus sp.	11 (24.44%)	28 (36.36%)	0.17 (NS)	
Ectoparasites				
Overall	**35 (77.78%)**	**72 (93.50%)**	**0.01***	**Female vs Male=4.1**
Columbicola columbae	29 (64.44%)	67 (87.01%)	0.003**	
Menopon sp.	17 (37.78%)	38 (49.35%)	0.22 (NS)	
Lipeurus sp.	21 (46.67%)	54 (70.13%)	0.01*	

*N= Number of bird examined, *means significant at 5% level of significance (P< 0.05), ** means significant at 1% level of significance (P< 0.01), NS means statistically Not Significant.*

3.4 PATHOLOGY OF INTESTINE INFECTED WITH PARASITES OF PIGEON

During the postmortem examination, it was grossly found that enlargement of intestinal diameter; blockage of intestinal lumen by parasites (Fig. 9 and 10). Histopathological study revealed that the tissue section of intestine shows massive degenerative changes in the epithelial papillae, distraction, sloughing and degeneration of villi and desquamation of intestinal epithelium (Fig. 11 and 12).

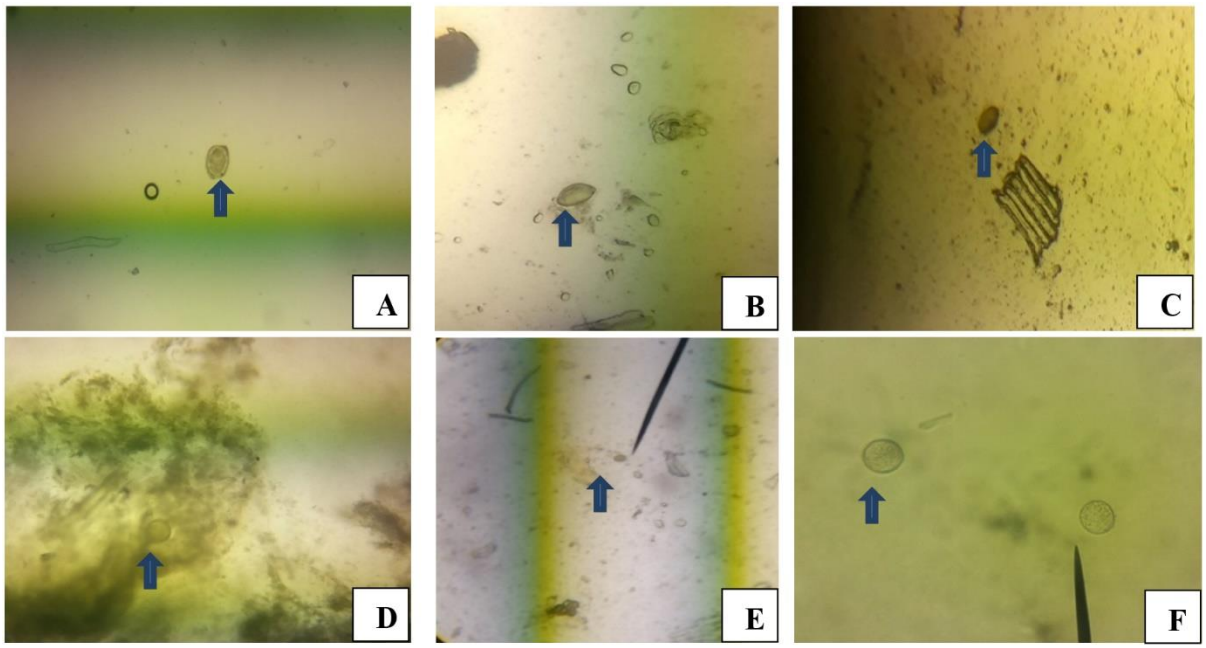

Fig. 4. Egg of Ascaridia sp. (A), Capillaria sp. (B), Ornithostrongylus sp. (C), Raillietina sp. (D), Echinostoma sp. (E) and Oocyst of Eimeria sp. (F)

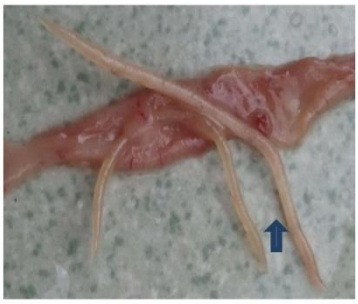

Fig. 5. Ascaridia sp.

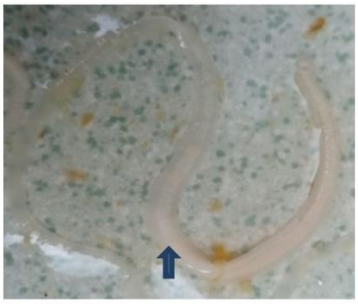

Fig. 6. Raillietina sp

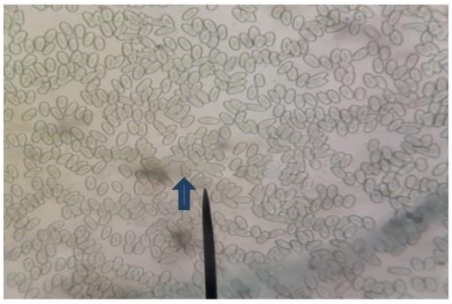

Fig. 7. Haemoptoteus sp. (blood smear staining with Giemsa stain)

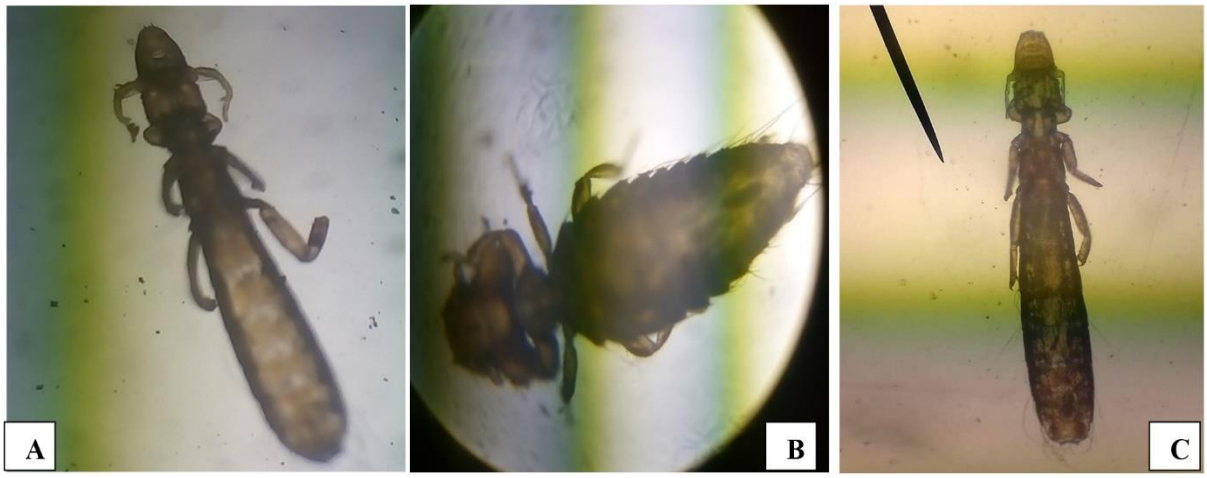

Fig. 8. Columbicola columbae (A), Menopon sp. (B) and Lipeurus sp. (C)

Fig. 9. Distended intestine

Fig. 10. Blockage of intestinal lumen by parasites

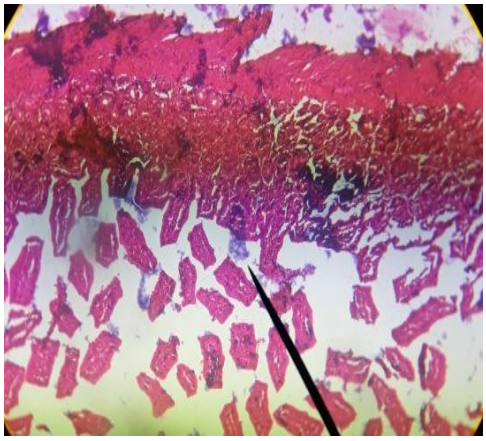

Fig. 11. Distraction and degeneration of intestinal villi

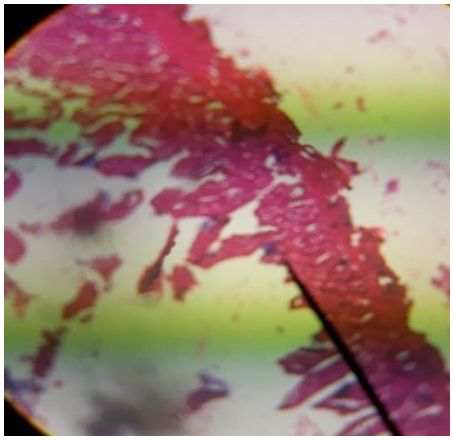

Fig. 12. Mucosal ulceration and sloughing of intestinal epithelium

4 DISCUSSION

4.1 OVERALL PREVALENCE OF PARASITES IN PIGEON

The present investigation indicates that about 78.69% pigeons were infected with one or more species of the following helminthes including *Echinostoma* sp. (19.67%), *Raillietina* sp. (37.67%), *Ascaridia* sp. (41.80%), *Capillaria* sp. (31.15%) and *Ornithostrongylus*sp. (12.3%). These results show similarity with the findings of Msoffe *et al*. (2010) and Senlik *et al*. (2005) who found that 79.5% and 74% pigeons were infected with one or more species of gastrointestinal helminth respectively. The observations of Sivajothi and Reddy (2015) nearly support to the present findings who reported 72.7% of gastrointestinal parasitic infection in pigeon of which *Ascaridia columbae* (33.3%), *Capillaria columbae* (17.4%) and Raillietina (9.0%). Layla *et al*. (2016) observed 72.4% pigeons infected with helminthes in which 28.6%*Capillaria columbae*is consenting with the present findings. The overall prevalence of helminthes in this study shows higher than the results of Adang *et al*. (2009) who recorded 56.7% helminth parasites. The similar prevalence of *Ascaridia* sp. was recorded by Senlik *et al.* (2005) who reported that *Ascaridia columbae* was 42%. These results are more or less similar to the findings of some others. Tanveer *et al*. (2011) recorded *Ascaridia columbae* (32.8%) and *Capillaria obsignata* (67.2%) prevalence in pigeons. Begum and Sehrin (2012) reported *Echinostoma revolutum* (15%), E*. trivolvus* (5%) in pigeon. Abed *et al*. (2014) recorded 46.31% *Raillietina* spp. and 38.94% *Ascaridia*spp. Moreover, the highest prevalence of *Ascaridia* sp. infection shows the similarity with the findings of Ghosh *et al*. (2014) who found that the highest prevalence of *Ascaridia galli* (35%) among helminthes and Rabbi *et al*. (2006). Prevalence of *Ascaridia columbae*, *Raillietina* spp. And *Capillaria* sp.in this studyshows much higher than the findings of Bahrami *et al.* (2013) and Tongson *et al.* (1975) recorded *Ornithostrongylus quadriradiatus* in domestic pigeon in Philipines.

The present study revealed that the overall prevalence of protozoan parasites was 58.20% of which *Eimeria* sp., *Trichomonas* sp. and *Haemoproteus columbae* were 36.89%, 38.52% and 31.97% respectively. The results are close to the observation of Radfar *et al*. (2012) who reported *Eimeria* sp. (40.17%) and *Trichomonas gallinae* (57.84%) and Abed *et al.* (2014) and) who reported 29.47% of *Haemoproteus* sp. respectively and Layla *et al*. (2016) who noticed Eimeria oocyst (33.3%). Higher prevalence of *Eimeria*sp. than the present observation was recorded by Parsani *et al.* (2014) who reported 77% and the lower prevalence of *Trichomonas* sp. than present study was observed by Abed *et al.* (2014) who found 10.52%. Higher prevalence rate of *Haemoproteus columbae* was reported by Marques *et al.* (2007) and Dranzoa (1999) and lower was observed by Doosti *et al*. (2014), Bahrami *et al*. (2012) and Dey *et al*. (2010).

The present study revealed that the overall 87.70% pigeons were infested by the three species of ectoparasites including *Columbicola columbae* (78.69%), *Menopon* sp. (45.08%) and *Lipeurus*sp. (61.48%).The present findings are slightly higher than the findings of Adang *et al.* (2008) who reported 73.8% pigeons were infested with ectoparasites. These results are closely related to the results of Radfar *et al.* (2012) who reported *Columbicola columbae* (79.41%) and *Menopon* sp. (44.08%). The prevalence of *Columbicola columbae* and *Menopon* sp.was lower than the findings of Begum *et al.* (2011) who reported that the prevalence of *Columbicola columbae* and *Menopon*sp. was 100% and100% respectively but the higher prevalence of *Lipeurus* sp.was found in the present investigation than the reports of Begum *et al.* (2011).The present findings differ with the observation of Adang *et al.* (2008) who reported lower prevalence of *Columbicola columbae* (63.8%) and *Menopon* sp. (6.3%) than the present findings. Moreover, the prevalence of *Lipeurus* sp.and *Menopon* sp. was much higher in the present study than the findings of Bahrami *et al.* (2012).

These variations among the present and earlier studies might be due to rearing practice, geographical location, study period, differences in sample collection techniques, and deviation in identification procedure.

4.2 Age Related Prevalence Of Parasites In Pigeons

It was revealed that there was an effect of age on the prevalence of helminth parasites in pigeon. Among the age group, adult (>3 months) pigeons were comparatively more affected (81.93%) than young (1- 3 months) pigeons (71.79%).The present results are in the line with the findings of Gosh *et al.* (2014) and Sivajothi and Reddy (2015) who reported that adults were more susceptible than squab. Msoffe *et al.* (2010) also reported that prevalence of gastrointestinal worm was significantly higher in adults than the nestling.

In the present study, it was observed that there was significant difference in the rate of infection in between young and adult pigeons. Under the present study the prevalence rate of ectoparasites was higher in adult (96.39%) than young (69.23%) pigeons. These results support to the findings of Gosh *et al.* (2014) who found that adult pigeons (86%) are more prone to ectoparasites in compare to squabs (48%).

Higher prevalence of such helminthes and ectoparasites in adults might be due to sharing of common premises with others which acts as an important reservoir and transmission media for soil transmitted helminthes (Islam *et al*., 2009) and ectoparasites.

Age had an effect on the prevalence of protozoa in pigeon. Young pigeons (64.10%) are more prone to protozoa than adult pigeons (55.42%). The present findings are in the disagreement with the finding of Kulisic (1989a) who reported that protozoan infections were detected more in adults (31.91%) than young (25%) pigeons. *Eimeria* sp. was found significantly higher in young than adult pigeon which is positively equal to the observation of Sivajothi and Reddy (2015) but differs with the reports of Gosh *et al.* (2014). Begum *et al.* (2008) reported that the prevalence of *Trichomonas gallinae* was more in adult pigeons (75%) than young pigeons (72.1%) which are dissimilar to the present results. The exact cause of higher prevalence of protozoa in young than adult pigeons can not be explained but it can be hypothesized that younger birds have less developed immune system compared to adults.

4.3 Sex Related Prevalence Of Parasites In Pigeons

The present results showed that sex of pigeon had an influence on the prevalence of helminth parasites. Under the present study the higher prevalence of helminth parasites in farmed pigeon was in female (80.52%) than male (75.56%) which was not statistically significant. The present findings are in the agreement with the findings of Adang *et al.* (2009) reported the sex specific prevalence rate of helminth was 60% in female and 55% in male pigeons. Khezerpour and Naem (2013) who recorded that the prevalence of helminth parasites was significantly higher in female (65.62%) than male (34.47%) pigeons. Abed *et al.* (2014) reported that the prevalence of *Raillietina* sp. and *Ascaridia* sp. was 47.7% and 46% in male and 52.3% and 54% in female respectively which is positive to the present study. The prevalence of *Ascaridia* sp. was found higher in female (45.46%)

than male (35.56%) pigeons which does not support to the observation of Senlik *et al.* (2005) who reported 38.2% in females and 46.7% in males. The present investigation is not related to the results of Tanveer *et al.* (2011) who reported the prevalence of *Capillaria obsignata* was 72.7% in male and 60% in female.

The results revealed that there was an effect of sex on the prevalence of protozoan parasites in pigeon. In the present study the sex related prevalence of protozoan parasites was higher in female (64.94%) than male (46.67%) pigeons. These results are in the line with the observation of Abed *et al.* (2014) who observed that females are more susceptible to *Haemoproteus* sp. and *Trichomonas* sp. than male. The present results are related to the results of Begum *et al.* (2008) who reported that *Trichomonas gallinae* was higher in female (70.9%) than male pigeons (63.8%) and Islam *et al.* (2013) who found that females (31.58%) are more prevalent than male (19.3%) for *Haemoproteus* sp. but in contrast with Al-Barwari and Saeed (2012) who found that male pigeons have more prone to infection than female.

The sex related prevalence of ectoparasites in farmed pigeons showed highest prevalence found in female (93.50%) than male pigeons (77.78%).There was significant sex related difference found in the prevalence of *Columbicola columbae* and *Lipeurus* sp. but no significance difference in case of *Menopon* sp. The present observations support to findings of Adang *et al.* (2008) who reported that female (74.3%) had a higher prevalence than male pigeons (73.2%). Moreover, the equal prevalence rate (60%) of ectoparasites in female and male pigeons was recorded by Adang *et al.* (2009).

The actual cause of higher prevalence of parasites in female pigeons can not be demonstrated but it can be thought that hormonal influence and stress may affect the immunity of female pigeon which may be responsible for more parasitized than male.

4.4 Pathology Of Intestine Infected With Parasites Of Pigeon

In the present study, it was found that histopathological findings of parasite infected intestine of pigeon were obliteration of normal structure, degenerative changes in the epithelial papillae of intestine, destruction and degeneration of intestinal villi and desquamation of intestinal epithelium. The present findings are in line with observation by Abed *et al.* (2014) who observed ulceration and sloughing of epithelial lining of intestinal mucosa, distraction and degeneration of villi, desquamation of epithelium, destruction of secretary glands, infiltration of inflammatory cells and atrophy of villi and Bahrami *et al.* (2013) reported degenerative changes in the epithelial tissue of intestine. The histopathological changes might be due to continuous irritation of parasites to the intestinal wall.

5 Conclusions

The prevalence and intensity of different endo and ectoparasites in pigeons of Dinajpur sadar and variation in the prevalence and intensity of parasites in relation to age and sex were studied. In this study, eleven (11) species of both endo and ectoparasites were identified namely *Echinostoma* sp.*, Raillietina* sp.*, Ascaridia* sp., C*apillaria* sp.*, Ornithostrongylus* sp.*, Eimeria* sp., *Trichomonas* sp., *Haemoproteus* sp., *Columbicola columbae, Menopon* sp. and *Lipeurus* sp.. It was revealed that age and sex of pigeon had no significant (P>0.05) effect on the prevalence of helminthes and protozoa but had significant influence on the occurrence of ectoparasites. However, histopathological changes of infected intestine were also studied. It is recommended that further study should be conducted to determine the effect of parasite on the performance of pigeons and to find out the economic losses, effective preventive and control measures of those parasites. It is concluded that parasitic infestation is the major problem of pigeon farming in this area, so specific precautions must be taken against parasitic infections in farmed pigeons.

References

[1] Abed A. A. A., Naji H. A. and Rhyaf A.G. (2014). Investigation study of some parasites infected domestic pigeon (*Columba liviadomestica*) in Al-Dewaniya city. *IOSR Journal of Pharmacy and Biological Sciences*; 9 (4): 13–20.

[2] Adang K. L., Oniye S. J., Ezealor A. U., Abdu P. A. and Ajanusi O. J. (2008). Ectoparasites of Domestic Pigeon (*Columba livia domestica,* Linnaaeus) in Zaria, Nigeria.*Research Journal of Parasitology*; 3 (2): 79–84.

[3] Adang K. L., Oniye S. J., Ezealor A. U., Abdu P. A., Ajanusi O. J. and Yoriyo K. P. (2009). Ectoparasites and intestinal helminths of speckled pigeon (Columba guinea Hartlaub and Finsch 1870) in Zaria, Nigeria. *Science World Journal*; 4 (2): 1–5.

[4] Al-Barwari S. and Saeed I. (2012). The parasitic communities of the rock pigeon Columba Livia in Iraq Component and Importance.*Turkiye Parazitoliji Dergisi*; 36: 232–239.

[5] Bahrami A. M., Monfared A. L. and Razmjoo M. (2012). Pathological study of parasitism in racing pigeons: An indication of its effects on community health. *AfricanJournal of Biotechnology*; 11 (59): 12364–12370.

[6] Bahrami A. M., Razmjoo M., Hafaziahmadi M. R., Louei M. A. and Hosseini E. (2013). Histo-pathological effects of different arthropoda, oocyste and worms infestation on the wild pigeon. *European Journal of Experimental Biology*; 3 (1): 411–416.

[7] Basit T., Pervez K., Avais M. and Rabbani I. (2006). Prevelance and chemotherapy of nematodes infestation in wild and domestic pigeons and its effects on various blood components. *Journal of Animal and Plant Science*; 16: 1–2.

[8] Begum A. and Sehrin S. (2011). Prevalence and seasonal variation of ectoparasite in pigeon, *Columba livia* (Gmelin, 1789) of Dhaka. *Journal of the Asiatic Society of Bangladesh, Science*; 38 (1): 93–98.

[9] Begum N., Mamun M.A.A., Rahman S.A. and Bari A.S.M. (2008). Epidemiology and pathology of *Trichomonas gallinae* in the common pigeon (*Columba livia*). *Journal of Bangladesh Agricultural University*; 6 (2): 301–306.

[10] Cable R. M. (1957). An Illustrated Laboratory Manual of Parasitology.4th edition. Burges Publishing Co. Minneapolis 15, Minnesota, USA.; 114–115.

[11] Cheesbrough M. (1990). Medical Laboratory Manual for tropical countries. Second edition, University Press Cambridge.

[12] Dey A. R., Begum N., Paul S. C., Noor M. and Islam K. M. (2010). Prevalence and Pathology of Blood Protozoa in Pigeons Reaered at Mymensingh District, Bangladesh. *International Journal of Bio Research*; 2 (12): 25–29.

[13] Doosti A., Ahmadi R, Mohammadalipour Z., and Zohoor A. (2014). Detection of *Haemoproteus columbae* in Iranian pigeons using PCR. International Conference on Biological, Civil and Environmental Engineering (BCEE-2014), Dubai (UAE).

[14] Dranzoa C., Ocaido M. and Katete P. (1999). The ecto-gastro-intestinal and haemo-parasites of live pigeons (*Columba livia*) in Kampala, Uganda. *Avian Pathology*; 28 (2): 119–124.

[15] Ghosh K. K., Islam M. S., Sikder S., Das S., Chowdhury S. and Alim M. A. (2014). Prevalence of Ecto and Gastrointestinal Parasitic Infections of Pigeon at Chittagong Metropolitan Area, Bangladesh. *The Journal of Advances in Parasitology*; 1 (1): 9–11.

[16] Hendrin C. M. and Robinson N. (2006). Diagnostic Parasitology for Veterinary Technicians (3rd Ed.), Mosby Inc. and affiliated of Elesevier Inc.; 255–260.

[17] Islam A., Anisuzzaman, Kalam A., Rabbi M. A., Rahman A., Islam M. A. and Rahman M. H. (2013). *Haemoproteus* spp. Infection of Domestic Poultry of Bangladesh. VETSCAN; 7 (2): 132.

[18] Islam A., Trisha A. A., Das M. and Amin M. R. (2009). Retrospective study of some poultry diseases at Gaibandha district in Bangladesh. *Bangladesh Journal of Veterinary Medicine*; 7 (1): 239–247.

[19] Kabir M.A. (2014). Sexing in pigeons by phenotypic method. International Journal of Advanced Research in Biological Science; 1 (5): 33–38.

[20] Khezerpour A., Naem S. (2013). Investigation on Parasitic Helminthes of Gastrointestinal, Liver and Lung of Domestic Pigeons (*Columba livia*) in Urmia, Iran. *International Journal of Livestock Research*; 3 (3): 35–51.

[21] Kulisic Z. (1989a). Parasitical infection among pigeons (Columba livia) of different ages in the area of Belgrade. *Acta Veterinaria Beograde*; 39 (2-3): 155–162.

[22] Layla O., Elmajdoub and Mshiheet K. A. (2016). A Survey of Intestinal Parasitic Infection Among Domestic Pigeons in Misurata, Libya. The Third Symposium on Theories and Applications of Basic and Biosciences.63–68.

[23] Levine N. D. (1985). Veterinary Protozoology.1stedition. Iowa State University Press, Ames.; 266–282.

[24] Luna L. G. (1968). Manual of Histologic staining methods of the Armed forces Institute of Pathology. 3rd edition. Mc Graw Hill Book Co. New York.

[25] Marques S. M. T., De Quadros R. M., Da Silva C. J. and Baldo M. (2007). Parasites of pigeons (*Columba livia*) in urban areas of lages, Southern Brazil. *Parasitología latinoamericana*; 62: 183–187.

[26] McDougald L. R. (2003). In: Saif Y. M. (chief editor), Barnes H. J., Glisson J. R., Fadly A. M., McDougald L. R., and Swayne D. Diseases of poultry. 11thed., Iowa state press, Ames, Iowa.; 1006–1008.

[27] Msoffe P. L. M., Muhairwa A. P., Chiwanga G. H. and Kassuku A. A. (2010). A study of ecto- and endo-parasites of domestic pigeons in Morogoro Municipality, Tanzania. *African Journal of Agricultural Research*; 5 (3): 264–267.

[28] Nadeem M., Khan M. N., Iqbal Z., Sajid M. S., Arshad K. and Yaseen M. (2007). Determinants influencing prevalence of louse infestations on layers of district Faisalabad (Pakistan). *Britrish PoultryScience*; 48 (5): 546–550.

[29] Nath T. C., Bhuiyan M. J. U. and Alam M. S. (2014). A study on the presence of leucocytozoonosis in pigeon and chicken of hilly districts of Bangladesh. *Biological Sciences and Pharmaceutical Research*; 2 (2): 013–018.

[30] Parsani H. R., Momin R. R., Lateef A. and Shah N. M. (2014). Gastro-intestinal helminths of pigeons (*Columba livia*) in Gujarat, India. *Egyptian Journal of Biology*; 16: 63–71.

[31] Rabbi A. K. M. A., Islam A., Majumder S., Anisuzzaman and Rahman M. H. (2006). Gastro intestinal helmiths infection of poultry. *Bangladesh Journal of Veterinary Medicine*; 4 (1): 13–18.

[32] Radfar M. H., Norouzi Asl E., Seghinsara H. R., Dehaghi M. M., Fathi S. (2012). Biodiversity and prevalence of parasites of domestic pigeons (Columba livia domestica) in a selected semiarid zone of South Khorasan, Iran. *Tropical Animal Health Production*; 44 (2): 225–229.

[33] Sari B., Karatepe1 B., Karatepel M. and Kara M. (2008). Parasites of domestic (*Columba livia domestica*) and wild (*Columba livia livia*) pigeons in Nigde, Turkey. *Bulletin of the Veterinary Institute in Pulawy*; 52: 551–554.

[34] Schesselman J. J. (1982). Case control studies. Oxford University press, Oxford.174–177.
[35] Senlik B., Gulegen E. and Akyol V. (2005). Ectoparasites of domestic pigeons (*C. l. domestica*) in Bursa Province. *Turkiye Parazitoliji Dergisi*; 29 (2): 100–102.
[36] Silovsky G. D., Wight H. M., Sisson L.H., Fox T. L. and Harris S. W. (1968). Methods for Determining Age of Band-Tailed Pigeons. *Journal of Wildlife Management*; 32 (2): 421–424.
[37] Sivajothi S., Reddy B. S. (2015). A Study on the Gastro Intestinal Parasites of Domestic Pigeons in YSR Kadapa District in Andhra Pradesh, India. *Journal of Dairy, Veterinary & Animal Research*; 2 (6): 00057.
[38] Sol D., Jovani R. and Torres J. (2000). Geographical variations in blood parasites in feral pigeons the role of vector – Ecography; 23: 307–314.
[39] Soulsby E. J. L. (1982). Helminth, Arthropods and Protozoa of Domesticated Animals.7th edition. Baillire, Tindalle; 35–740.
[40] Springer W. T. (1997). Other blood and tissue protozoa edited by calnek B.W., Barnes H.J., Beard H.J., McDougald L.R. and Saif Y. M. In: Diseases of Poultry (10th edition) Iowa state University Press, U.S.A. 900–911.
[41] Tanveer M. K., Kamran A., Abbas M., Umer N. C., Azhar M. A. and Munir M. (2011). Prevalence and chemo-therapeutical investigations of gastrointestinal nematodes in domestic pigeons in Lahore, Pakistan. *Tropical Biomedicine*; 28 (1): 102–110.
[42] Tongson M. S., Sican V. and Trovela V. (1975). *Ornithostrongylus quadriradiaatus* (Stevenson, 1904) a hitherto unreported helminthes of domestic pigeons in the Phillipines. Philippine Journal of Veterinary Medicine; 14 (1): 144–150.
[43] Urquhart G. M., Armour J., Duncan J. L., Dunn A. M. and Jennings F.W. (2000). Veterinary Parasitology, second ed. Blackwell publishing, United Kingdom.