CHAPTER-1

INTRODUCTION

Bangladesh is a developing country with a growing poultry industry. Poultry farming, which is a crucial component of the livestock industry, has a significant impact on Bangladesh's agro-based economy. Domestic pigeons (*Columba livia*) are found everywhere in nature and are associated with humans. Pigeons are kept as pets, and they also have significant religious and cultural meanings and source of sustenance, as a hobby, as a symbol, and for experimental purposes in the wild, where they coexist with humans and other animal species They do not migrate, but they have an excellent sense of direction and can navigate back to their nests from great distances if they are allowed to. Bangladesh is home to around 20 different pet pigeon species, including the Gola pigeon, White king, Tumbler, Rolling pigeon, Fantail, and Lahores. Examples: Jacobin, Lakkha, Pouter, etc. (Rahman, 1999). Many reputable pigeon farms have recently cropped up in various parts of Bangladesh, including Dhaka, Chittagong, Rajshahi, Natore, Pabna, Dinajpur, Khulna, Rangpur, Kustia, Norshindi, and others. In addition, the district of Chattogram is home to approximately one thousand pigeon farms of varying sizes. They established the Dewan Hat High Flyer Pigeon Club Chattogram and United Fancy Pigeon Club, among others. Pigeons are hosts to a multitude of endoparasites, including cestodes, nematodes, and unicellular protozoa. (Senlik et.al., 2005). They also discovered that the most common parasites that affected pigeons were Ascaridia columbae and Capillarea spp. the study by Parsani et al. (2014). Pigeons are known to spread a wide variety of parasites and pathogens to other flocks. Pigeons frequently occupy people's properties and pollute the environment with their droppings. Pigeons are susceptible to a wide variety of parasites, all of which can significantly slow down their growth, development, and productivity, which can sometimes even result in death, particularly in young squabs. (Fatihu et al., 1991). are a potential vector for the transmission of zoonotic parasites because of their interaction with humans as well as other domestic and wild birds. (Adang et al., 2008). Despite its susceptibility to gastrointestinal parasites ectoparasite and blood protozoal infection limited research has been conducted on prevalence in chattogram. Still there is a paucity of information regarding the socioeconomic significance, management, and health implications of these birds. Pigeons have been accorded a relatively low priority in terms of research because of the general consensus that they do not play an especially significant role. Pigeons are known to suffer from a wide variety of internal and external parasites as well as infections in many parts of the globe, according to various reports. (Senlik et al., 2005; Marques et al., 2007; Bunbury et al., 2008; Abreu-Acosta et al., 2009. The effects of parasitism on birds are often severe including retarded growth, low egg production and susceptibility to other infections. Other more subtle effects of ectoparasites may also be important. Control measures can only be effective after a thorough study of these parasites and host parasite relationships. In addition, this study's findings may serve as a guide for certain control measures, such as in the case of cross-infections, where the control of parasites in one host may aid in the eradication of the same parasite in another host. This country's geo-ecological conditions are favourable for pigeon rearing (Rahman, 1999). This was accomplished by collecting feces and performing postmortem examinations. Thorough understanding of the parasitic disease that affects pigeons would be helpful in the development of potential control measures that might contribute to the improvement of the species' chances of survival and complement efforts to educate the general public. There is a wealth of information on avian medicine, including parasitic illnesses. Many pigeon health issues, both immediate and long-term, may have their roots in parasites. Protozoa (one-celled animals), helminths (worms), and arthropods (insects) are common types of avian parasites. (insects and mites). The outcomes can range from being completely harmless to instantly fatal. (Ritchie et al., 1997). According to the reviewed literature, *Ascardia sp. Capillaria sp*., and *Heterakis sp*. were the most frequently observed parasites in the gastrointestinal tract of pigeons and *Menopon gallinae*, *Menacanthus straminius*, *collumbicola columbae*, *Lipeurus caponis* was the most prevalent ectoparasite found in pigeon and *Haemoproteus* and *Leucocytozoon* was the blood protozoa in pigeon. Consequently, the purpose of this study is to determine the prevalence of gastrointestinal parasites, ectoparasite and blood protozoa identify them to the genus level, compare prevalence by region and by infection, and determine pigeon parasite-related health care. Bangladesh faces many challenges, including a poor husbandry system and hazardous seasonal variation (heat stress, disease, and parasitic infestations are just a few examples) that result in significant loss for the proprietor and the nation. There are numerous gastrointestinal and ectoparasites, as well as blood protozoa, that cause significant loss of pigeon health and output. Domestic pigeons are common in nature and are associated with humans all over the globe. This study aimed to identify GI parasites and learn about the prevalence of parasitic infestation of pigeons in the Chattogram district because of the economic significance of parasitic infestations to the development of a profitable poultry industry. People in Chattogram are extremely crazy to raise pigeons on their roofs of buildings or in front of their homes for economic or aesthetic reasons, but this practise causes enormous economic loses due to an excess parasitic load. The research will assist in the identification of the parasites as well as the discovery of effective anthelmintic drugs that can be used for the correct management of these diseases. This will assist pigeon owners in expanding their pigeon businesses, which will in turn contribute to the overall economy.

1. Objectives of the study:

(i) To determining the overall prevalence of gastrointestinal parasites in pigeons (*Columba livia*) in chattogram metropolitan area.

(ii)To determine the prevalence of blood protozoa in pigeon in chattogram metropolitan area.

(iii)To determine the prevalence of ectoparasites.

iv) To determine the association between parasitic prevalence and demographic characteristics of pigeons.

CHAPTER-II

REVIEW OF LITERATURES

Admissible literature on gastrointestinal, ectoparasite and blood protozoan disease occurences along with their associated risk factors in pigeon are reviewed in this chapter. This chapter will represent the current and more relevant information concerning the research work.

2.1 Pigeon identifying characteristics

The adult nominate variety pigeon weighs around 369 g, measures between 32 and 37 centimetres in length, and has a wingspan of 64 to 72 centimetres Pigeons have a head, neck, and torso that are a dark bluish-grey color, and the feathers around their necks and wings have a glossy greenish and reddish-purple sheen to them. In adults, the iris is orange or red, with a pale inner ring; in adolescents, the iris is brown or greyish brown. .This pigeon has a black bill with an off-white cere, scarlet feet and legs, twin black wing bars, and white lower back feathers. (PCRC, 2009).

2.2 Indicator of a pigeon's health

The appearance of the dropping, both in terms of its quantity and its quality; the amount of food and water ingested; behaviour; posture; body weight; rate and depth of respiration (Jalal et al., 2011).

2.3 Symptoms of illness

.the release of fluid from the nostrils, eyes, or mouth; A large amount of feathers falling out or feathers that are misshapen or ruffled; dirty vents; a lethargic or closed eye;. foot deformities such as lameness, wounds, or swelling; beak and nail overgrowth; stains or scabs on areas of the body without feathers (Jalal et al., 2011).

2.4 Pigeon’s ecology

Always, but especially during the warmer months of spring and summer (Williams and Corrigan, 1994). They reach peak reproductive potential between the ages of five and six, and they continue reproducing, albeit at a lower rate, well into their tens. There is not a single polygamous columbiforme. Cliffs in the interior and the shore are both used for nesting by wild birds. Typically found in urban regions, feral birds lay their eggs on or in buildings. A flimsy nest is constructed on a ledge, a rocky shelf, or in the roof space of a structure. Female deposits one or two white eggs, which are then incubated for 17–19 days by both parents. The squab has pink bill and golden down. Both spouses feed "crop milk" to the squabs The time it takes for a bird to leave its nest and fly free is roughly 30 days. Between four and six weeks of age, the offspring fledge from the nest. It takes more than one clutch to exit the nest Sexual development in young pigeons occurs between the ages of six and seven months. (Hollander, 1954; Levi, 1969; Sturtevant and Hollander, 1978; Kendall and Scanlon, 1981). Males and females make up roughly the same percentage of a pigeon community. Pigeons have a wide range of life expectancies, ranging from 3-5 years to 15 years, depending on a variety of variables, including natural predation and human intervention. Pigeons frequently live up to 15 years in confinement, and occasionally even longer. (Williams and Corrigan, 1994).

Pigeons get the majority of their nutrition from different kinds of seeds and cereals. Some species that graze on the ground (called granivorous species) consume fruit in addition to taking in insects and worms. One of the species, known as the Atoll Fruit Dove, has modified its diet to include small reptiles and invertebrates The feral pigeon found in metropolitan areas subsists solely on a diet of seed, typically obtained from human sources, and human waste, such as leftover fast food left over by people either knowingly or unknowingly. (Williams and Corrigan, 1994). Vegetables and berries are part of the wood pigeon's diverse diet Pigeons require about 20-100 gm of food per day, or about one-tenth of their body weight, based on the breed. (Sturtevant and Hollander, 1978). Water intake for a pigeon ranges from 36 to 60 millilitres per day. (Clarkson et al., 1963).

Pigeons can soar at speeds of up to 92.5 mph and at altitudes of 6000 feet or higher, with an average speed of up to 77.6 mph. Pigeons can travel between 600 and 700 miles per day, with the longest flight between Africa and England in the 19th century lasting 55 days and covering 7000 miles. It is believed that pigeons use the magnetic field of the planet to sense their location and the sun to guide them. Roads and even low-frequency earthquake waves have been proposed as alternate means of navigation back to safety. Sucking water through their beaks like straws is how pigeons and other members of the columbidae family stay hydrated. The common practise of birds drinking is to tilt their head back and take a mouthful. (PCRC, 2009).

If they are contained within fly pens, pigeons can be reared in environments with significant seasonal shifts in temperature, humidity, light, and barometric pressure. Temperatures between 10 and 24 degrees Celsius (50 and 57 degrees Fahrenheit) and relative humidities of 30 percent should be maintained for caged birds. The typical diurnal cycle consists of 12 hours of light and 12 hours of darkness; however, providing 14 hours of light will encourage more reproductive activity. (Sturtevant and Hollander, 1978). Pigeons produce 10 to 22 young per year in successive clutches of two eggs, with 15 to 16 regarded a good commercial production. Clutches are separated by five-week intervals. (Levi, 1969; Kendall and Scanlon, 1981; Hollander, 1954; Sturtevant and Hollander, 1978).

2.5. Parasites, pigeons, and humans in the wild:

Pigeons have widely colonised most of the world, including five continents and extremely isolated islands, made possible by their high dispersal ability (Pereira et al. 2007). The most significant difference between urban and less modified or wild ecosystems is the large part that humans play. Pigeons have widely colonised most of the world, including five continents and extremely isolated islandsPeople have a profound impact on urban biodiversity through their control of pest populations, provisioning of famous species (especially birds), and protection from exploitation. (Tangley, 1986). In fact, research suggests that as many as 57% of humans may feed wild animals (Rollinson et al., 2003), which can have a significant impact on population growth. Long-standing human-wildlife conflicts with feral pigeons include the birds' unwelcome noise for city dwellers (Jerolmack, 2008), the harm their nesting and droppings cause to buildings and other surfaces (Sacchi et al., 2002), and the birds' potential to spread diseases to humans. (HaagWackernagel and Moch, 2004). Each pigeon excretes approximately 12 kg of excrement per year, which pollutes breeding areas, building faces, monuments, sidewalks, and other public areas. (HaagWackernagel and Geigenfeind, 2008At least 110 human pathogens have been found in feral pigeons, but only about 230 human infections have been documented anywhere in the globe. (Haag-Wackernagel and Moch, 2004). Pigeons, for instance, are known to be carriers of and transmitters of encephalitis, histoplasmosis, newcastle disease, pigeon ornithosis, cryptococcosis, pigeon coccidiosis, toxoplasmosis, pseudo-tuberculosis, and salmonella food poisoning. Pigeon ornithosis is an illness that affects the digestive system. Pigeon coccidio (Rehman, 1993; Opara et al, 2012. Additionally, pigeons have been known to transport parasites like mites, fleas, and ticks. (BalickaRamisz et al., 2007; Rehman, 1993). Others consider pigeons to be an integral part of city life and take pleasure in caring for, communicating with, and feeding them. (Johnston and Janiga, 1995). People who like pigeons in cities are likely to have strong opinions against control measures that could contribute to conflicts between humans and wildlife.

2.6. Common pigeon parasitic diseases:

Many pigeon health issues can be traced back to parasites, either as the original cause of the illness or as a carrier for the spread of other diseases.

Ectoparasites- Pigeons are susceptible to a variety of different ectoparasites, the most prevalent of which are *Pseudolynchia caneriensis*, *Menopone gallinae, Menacanthus starmineus*, *Colpocephalum turbinatum, Columbicola columbae, and Lipeurus caponis*. (Dranzoa et al., 1999).

Protozoa's Illnesses - The protozoan *Hemoproteus* causes "pigeon malaria," a serious anaemia that primarily affects racing homing pigeons. The hypoboscid fly (louse fly) is the vector for *Hemoproteus.* The treatment involves the use of pyrethroids or other types of insecticides to contain the vector. Canker, also known as *Trichomoniasis:* A protozoan infection caused by the organism The protozoan illness caused by *Trichomonas gallinae* in columbids has the potential to cause the most severe consequencesIt has a broad geographic distribution and occasionally affects both fancied and wild pigeons. However, experimental pigeons shouldn't experience any issues with it. (Kocan and Banko, 1974).

Helminths

Ascaridia (round worm), *Capillaria* (crop worm and hair worm), *Syngamus tracheae* (grape worm), and Tetrameres fissipina (which affects the proventriculus) are just a few examples of the internal parasites that have gained widespread attention since the domestication and intensive confinement rearing of pigeons. (Schock and Cooper, 1978).

2.7. Characteristics of some prevalent gastro intestinal parasite eggs:

Syngamus trachea: Eggs that are ellipsoidal in shape and have an operculum at both sides.

***Capillaria obsignata*:** Eggs that are roughly ellipsoidal in form and have an operculum on both ends.

***Heterakis gallinarum*:** The egg has a glossy exterior and the shape of a sphere; it is somewhat analogous to the shape of an ascaridia.

***Ascaridia galli*:** The egg is clearly oval in shape and has a smooth exterior. It is slightly bigger than the Heterakis.

***Eimeria tropicalis*:** Oocysts range in size from 10 to 24 micrometres and have a spherical to subspherical form. (Soulsby, 1982).

2.9. Identifying character of some common ecto parasites

***Lipeurus caponis*:** Wing louse; elongated, narrow species; measures 2.2 mm in length and 0.3 mm in breadth; has narrow legs, with the back legs being roughly twice as long as the front pair; head-borne angular projections of a tiny size.

***Menacanthus stramineus*:** Adults of this species measure approximately 3.5 millimetres in length, and their abdomens are densely covered with setae of a medium length. Large lice can be found on the breast, quadriceps, and around the vent.

***Menopon gallinae*:** Yellow-colored shaft louse adults that are about 2 mm long, with an abdomen that has a sparse covering of medium-length setae. Found on the thigh or breast feathers of birds, particularly chickens. (Wall and Shearer, 1997)

***Pseudolychia canariensis*:** Pigeon louse flies, also known as body louse flies, are small, brown, dorso-ventrally flattened insects that feed on the blood of pigeons and doves. They are very sluggish flyers and about the size of house flies (5 to 6 mm head and body length, 6 to 7 mm wings). They are shielded from being squashed by the grooming host by a hard exoskeleton.

***Goniocotess gallinae*:** They have a head and body length of about 5 to 6 millimeters, and their wing span is between 6 and 7 millimetres. They move very slowly through the air. They are able to avoid being squashed by the grooming host thanks to a tough exoskeleton that they possess..

2.10. Identifying typical blood protozoa characteristics*:*

***Haemoproteus*:**

Parasitic birds, reptiles, and frogs are common hosts for the alveolate genus *Haemoproteus.* Greek origins can be seen in the moniker.: "blood" Haima and "Proteus," a sea deity with the ability to assume a variety of forms, were the parents of Proteus. In 1890, Kruse was the first to use the term *Haemoproteus* to describe H. columbae in the blood of the pigeon

Columba liviaThe erythrocytes are infected by protozoa, which are intracellular pathogens. They are spread by insects that feed on blood, such as horseflies, biting midges (Culicoides), louse flies (Hippoboscidae), and mosquitoes. ("tabanids", "tabanid flies"). Due to their parallels with Plasmodium species, infections caused by parasites in this genus are sometimes referred to as pseudomalaria. it's gametocyte partly surround the cell's nucleus and multiple refractile, golden-brown particles of hemozoin pigment. ***Leucocytozoon*:**

Create gamonts in the white blood cells and/or erythrocytes of the body. Gametocytes are responsible for the noticeable enlargement and distortion of the infected cell, which results in the appearance of a football. There is no evidence of merogony in either the leucocytes or the erythrocytes Parenchyma of the liver, heart, kidney, or other tissues may develop merogony. Cytomeres could form into large bodies that meronts make.

Hemozoin deposits (pigment) are not formed—a helpful distinguishing feature for *Leucocytozoon* from *Haemoproteus* and Plasmodium.

2.11. Prevalence study:

Capillaria sp., Ascaridia sp., and *Hetarakis sp*. were found to have respective incidences of 56.66%, 76.66%, and 16.66%, according to the findings of Borghare et al. (2009). Either *Ascaridia sp.* and *Capillaria sp*. or *Ascaridia sp.* and *Heterakis sp.* were found to be responsible for the mixed parasitic infestation that was found. Cysts of the bacteria Balantidium coli have also been discovered in pigeons.

Marques *et al.* (2007) carried out a study on parasites of pigeons in Brazil and reported the prevalence of gastrointestinal parasites was 74.14%. The highest infection rate was that of *Eimeria* oocysts (86.05%). *Capillaria* sp were detected in 11.62%. The fly *Pseudolynchia canariensis* was found beneath the feathers of all pigeons.

Intestinal worm prevalence was considerably higher (P 0.001) in adults than in nestlings, according to Msoffe et al. (2010). Compared to adults, nestlings seemed to be more prone to nematodes but less susceptible to gastrointestinal cestodes. *P. canariensis* were found in both nestlings and adults pigeons while *M. stramineus* and *M. gallinae* were found in adult only. There was no statistically significant difference in ectoparasite prevalence between the two age categories (P > 1). *H. columbae* was more common in adults, numerically speaking (P 0.001).

Street pigeons in Owerri, Imo State, Nigeria were tested for intestinal parasites by Opara et al. (2012). They found four parasites, with Trichomonas sp. having the highest prevalence rate (42%), followed by Eimeria sp. (28%), and *Coccidia sp.* and *Ascaridia sp.* having the lowest prevalence rates (14% each). Compared to men, females were more vulnerable to gastrointestinal parasite infestation.

Pinto et al. (2008) tested a total of 40 poultry for the presence of capillariid nematodes in Brazil and discovered 33 positive results. *B. obsignata* was found to have a preponderance of 72.5%, while *E. annulatus* was found in only 2.5% of the animals.

Parasite researchers Sari et al. (2008) found that coccidian oocysts were more common in domestic pigeons than in wild doves in Turkey. Faecal samples collected from both household and wild pigeons showed no evidence of Cryptosporidium oocysts. Domestic doves frequently contract infections from the parasites *Ascardia columbae* and *Capillaria sp.*

According to Parsani and Momin (2010), pigeons in Gujrat state, India, had worm, cestode, and coccidian infections at rates of 88.88%, 26.92%, and 74.07%, respectively. They also discovered that nematodal infection was more prevalent during the rainy season and less so during the winter**.**

In the Mymensingh district, the prevalence of Trichomonas gallinae was higher in female pigeons (70.9%) than in male pigeons (63.8%), according to Begum et al. Pigeons older than three months were hit harder than their smaller counterparts of 30–90 days of age. Summertime saw a statistically significant (P0.01) decrease in T. gallinae infection compared to wetter and colder months.

Basit et al. (2006) examined the faeces of 100 domestic and 100 wild pigeons and observed that the overall prevalence of nematode infestation was 57%. However, the prevalence of nematode infestation was 60% in wild pigeons and 55% in domestic pigeons, respectively. *Ascaridia columbae*, *Capillaria obsignata* and *Ascaridia galli* were prevalent nematodes in wild and domestic pigeons**.**

According to Borghare et al. (2009), the incidence of *Capillaria sp., Ascaridia sp.,* and *Hetarakis sp.* was 56.66 percent, 76.66 percent, and 16.66 percent, respectively. Either

Ascaridia sp. and *Capillaria sp*. or *Ascaridia sp.* and *Heterakis sp.* showed mixed parasitic infections. Balantidium coli cysts were also discovered in pigeons.

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According to Borghare et al. (2009), the prevalence of *Capillaria sp., Ascaridia sp.,* and Hetarakis sp. was 56.66%, 76.66%, and 16.66%, respectively. Infection with *Ascaridia sp. and Capillaria sp.,* or *Ascaridia sp. and Heterakis sp.,* was observed. *Balantidium coli* cysts were also discovered in doves**.** It was discovered that the overall prevalence of *Capillaria obsignata* was 67.2%, and the prevalence of *Ascaridia columbae* was found to be 32.8%. Both *C. obsignata* and *A. columbae* had a prevalence of 72.7% in males and 27.8% in females, whereas in males the prevalence of *C. obsignata* was 60% and *A. columbae* was 40%. There was not a significant gender-related difference found in the prevalence of either *C. obsignata* or *A. columbae* in household pigeons ($p>0.56$ and $p>0.40$, respectively

Dranzoa et al. (1999) found that in doves in Kampala, Uganda, Pseudolynchia caneriensis was the most common ecto parasite (100%) and Columbicola colubae was the second most common (94.1%). Cestode proglottids were detected in the feces, with an incidence rate of 23.5%.

In Tanzania, Muhairwa et al. (2007) assessed the prevalence of helminths in adult ducks that were allowed to roam free and found that the prevalence of gastrointestinal worms was statistically significantly greater (P 0.05) in ducklings than in adult ducks. The waterfowl showed no signs of having any trematodes.

The prevalence of parasitic diseases was found to be the greatest among the poultry examined by Islam et al. (2009) in the Gaibandha district of Bangladesh. This was followed by the incidence of bacterial diseases, viral diseases, non-infectious diseases, and aspergillosis. When compared to the summer months, the number of cases of parasitic diseases substantially increased (p 0.01). The percentage of people who had coccidiosis was 88%.

The faeces of 175 domestic ducks were investigated by Adejinmi and Oke (2011), who discovered that 167 of the ducks tested positive for the presence of gastro intestinal parasites. The most common type of gastrointestinal and intestinal infection was the ascaridia galli.

In a study on chickens for Capillaria Columba infection, Levine (1938) observed that C. columbae had been discovered in the chickens' intestines on many occasions.

CHAPTER-III
MATERIALS AND METHODS

3.1. Study period and study location

The research was carried out in different farm located in Chattogram metropolitan area between July 2022 and December 31 of the same year 2022. The samples were taken from three different farm within the metropolitan area. These farm were Agrabad, Dewan hat and colonel hat.

3.2. Data collection

The data collection instrument used is provided as Annex 6. The interview timetable for the farm owners and workers was planned with the goals in mind. The questions posed were usually very basic and straight to the point. The information gathered was also included in the data file.

3.3. Study population

In this research, 130 blood samples and 130 fecal and ecto parasite samples from 32 local and 98 cross-breed pigeons were collected from various farm of Chattogram metropolitan area and tested for the presence of gastrointestinal, ecto, and blood parasites. For direct microscopic analysis, a small piece of each sample was preserved in 10% formalin and taken to the Parasitology facility at Chattagong Veterinary and Animal Sciences University (CVASU).

3.4. Collection of sample and examination

The information, which included things like age, sex, method of rearing, history of deworming, history of feeding, history of housing management, etc., was recorded using a sample questionnaire. From the pigeon that was studied, ecto-parasites, a fecal sample, and a blood sample were taken as biological samples.

3.4.1. Ectoparasite collection and examination

Aerosol was sprayed over the body feathers and left for five minutes to gather ectoparasites. Parasites were gathered by shaking the pigeon and then preserving them in 70% alcohol. After that, each sample was transported to the Parasitology laboratory at Chittagong Veterinary and Animal Sciences University (CVASU), where it was placed in a refrigerator set to a temperature of four degrees Celsius pending the results of subsequent tests. The ectoparasites were recognised through the use of a microscope, as stated by Wall and Shearer (1997), Soulsby (1982), and Kettle (1995).

3.4.2. Fecal sample collection and examination

Each vial of the fresh feces was marked with a special identifying number and preserved in 10% formalin. At that time, basic demographic data (owner's name and address, animal ID, flock size, age, sex, weight, deworming history, etc.) were also gathered through a questionnaire. All of the samples were then taken to the Chattogram Veterinary and Animal Sciences University (CVASU) Parasitology laboratory and refrigerated at 4 degrees Celsius for further examinations.

On the other hand, in order to examine the fecal samples and determine the morphological characteristics of eggs, cysts, and oocysts, three distinct kinds of qualitative tests, namely direct smear, flotation, and sedimentation techniques, were utilised. These tests were performed. According to the procedure describe by Hendrin and Robinson, (2006); Soulsby, (1982).

3.4.2.a. Direct smear method: A spotless glass slide has a drop of water in the centre. With the aid of a tooth peck, a tiny amount of feces is extracted from the given sample and spread out to create a thin smear. This can be accomplished by carefully pulling the large particles on the glass slide to one side. Preferably, an appropriate cover slip should be positioned over the smear before the slide is examined with a microscope's low power objective.

3.4.2.b. Sample sedimentation method: In a beaker, approximately 3–5 grammes of feces and 100 millilitres of water were placed; the mixture was then thoroughly stirred; the beaker's contents were filtered through a sieve, and the supernatant was discarded; a drop of sedimentation was placed on a glass slide; a cover slip was placed over the drop; and the slide was examined using a microscope with 10x and 40x objectives.

3.4.2.c. Simple test tube floatation: The simple test tube flotation method is a qualitative test for the detection of Ascaridia spp eggs in the faeces. It is based on the separating of eggs from faecal material and concentrating them by means of a flotation fluid with an appropriate specific gravity.

Procedure:

(a) Approximately 3 g of faeces (measured with a recalibrated teaspoon)

(b) 50 ml flotation fluid added into.

(c) Feces and flotation fluid was thoroughly mixed with a stirring device (tongue blade, fork). (d) The resulting fecal suspension was thoroughly poured a tea strainer or a double layer of cheesecloth into Container 2.

(e) The fecal suspension was poured into a test tube from Container 2. (f) The test tube was placed in a test tube rack or stand.

(g) Gently top up the test tube with the suspension, leaving a convex meniscus at the top of the tube and carefully place a cover slip on top of the test tube.

(h) Let the test tube stand for 20 minutes.

(i) Carefully lifted off the cover slip from the tube, together with the drop of fluid adhering to it, and immediately placed the coverslip on a microscope slide. (Urquhart G.M, et. al.), (E.J.L. Soulsby)

3.4.3. Blood sample collection and examination:

The pigeon's blood was drawn from a vein in its wing, and a fine smear was prepared for examination as soon as possible after the blood was drawn. Standard procedure called for the smears to be air dried and dyed with Giemsa's stain. (Cable, 1957). For the purpose of finding blood protozoa, the slides were inspected under a microscope at a higher magnification (100). The morphology outlined by Levine (1985), Springer (1997), and Souls (1982) served as the basis for identification.

CHAPTER-IV

RESULT

4.1. Demographic scenario:

A total of 130 pigeons were examined for the presence of ecto and gastrointestinal (GI) parasite and blood protozoal infections. The suggested research was carried out in different farm located in Chattogram metropolitan area between 1 July 2022 and December 31 of the same year. Study population consisted of: local breed 75.4%(98) and cross breed 24.6%(32) including male 53.8%(70) and female 46.2%(60).I found two types of housing system intensive and semi intensive. 75.4%(98) pigeon reared in intensive house and 24.6%(32) reared in semi intensive housing system. Farm owner use litter mostly consisted of sand 46.2%(60) and saw dust 29.2%(38). Owner administered antelmentics in 62.3%(81) of pigeons before 8 months to 1 year ago and 37.7%(49) of pigeon did not get any anthelmentics.

Table-1: Demographic scenario

Traits	**Types**	**%(N)**
Strains	Local	75.4%(98)
	Cross	24.6% (32)
Sex	Female	46.2% (60)
	Male	53.8% (70)
Age (months)	≤6	17.7% (23)
	7-12	31.5% (41)
	13-18	18.5% (24)
	≥18	32.3% (42)
Housing	Intensive	75.4% (98)
	Semi-intensive	24.6% (32)
Anthelmentic	Yes	62.3% (81)
	No	37.7% (49)

4.2. Overall prevalence of Ectoparasite, Gastroparasite and Blood protozoa:

Examination on 130 sample for identification of ectoparasite and gastrointestinal parasite. For ectoparasite we found 77 positive case out of 130 sample and overall prevalence was 59.2%. In gastrointestinal parasite 81 positive case out of 130 sample where prevalence was 62.31%. In blood protozoal infection 45 positive case and prevalence was 34.6%.

Table-2: Overall prevalence of ectoparasite, gastrointestinal parasite and blood protozoa.

Name of the parasite	Total no. of sample	Positive case	Overall Prevalence (%)
Ectoparasite	130	77	59.2
Gastrointestinal parasite	130	81	62.31
Blood protozoa	130	45	34.6

4.3. Prevalence of gastrointestinal parasites:

We have examined 130 sample where we found four different species of gastrointestinal parasites including *Ascaridia sp, Capillaria sp, Heterakis sp, and Syngamus trachea*. Among these *Ascaridia sp* was 37%, *Capillaria sp.* 33.8%, *Heterakis sp* 17% and *Syngamus trachea* positive was 5.4%. Overall prevalence of gastrointestinal parasite was 62.31%.

Table-3: Prevalence of gastrointestinal parasite

Name of the Gastrointestinal parasites	Possitive No.	Prevalence (%)	Overall Prevalence (%)
Ascaridia sp.	48	37	62.31
Capillaria sp.	44	33.8	
Heterakis sp.	22	17	
Syngamus trachae	7	5.4	

4.4. Prevalence of ectoparasites:

By examining130 sample we found four different species of ectoparasites including *Lipeurus caponis, Columbicola columbiae, menopon gallinae, Menacanthus straminius*. Among these *Lipeurus caponis* was 38.5%. Positive case of *Columbicola columbae* was 31.5%. *Menopon gallinae* was 23.1%. and *Menacanthus straminius* was 15.4%. Overall prevalence of the ectoparasite was

59.2%.

Table-4: Prevalence of ectoparasites:

Name of the Ectoparasites	Positive No.	Prevalence (%)	Overall Prevalence (%)
Lipeurus caponis	50	38.5	59.2
Columbicola columbiae	41	31.5	
Menopon gallinae	30	23.1	
Menacanthus straminius	20	15.4	

4.5. Prevalence of blood protozoa:

In 130 sample we have found two species of blood protozoa: *Haemoproteus sp, Leucocytozoon sp*. Positive no. of Haemoproteus sp. was 21.5%. Positive case of *Leucocytozoon sp* was 13.1%. Overall prevalence of blood protozoa was 34.6%.

Table-5: Prevalence of blood protozoa

Name of the blood parasites	positive No.	Prevalence (%)	Overall Prevalence (%)
Haemoproteus sp	28	21.5	34.6%
Leucocytozoon sp	17	13.1	

4.6. Sex specific prevalence of blood protozoa of pigeon:

In this two type of blood protozoal infection in male species *haemoproteus sp.* 22.9% and *Leucocytozoon sp.* 15.7%. In female bird Haemoproteus sp. 20% and *Leucocytozoon sp*. was 10%.

Table-6: Prevalence of blood protozoa related to sex

Parameter	Name of Protozoa	Positive No.	Prevalence (%)
Male	*Haemoproteus sp*	16	22.9
	Leucocytozoon sp	11	15.7
Female	*Haemoproteus sp*	12	20
	Leucocytozoon sp	6	10

4.7. Association of gastrointestinal parasitic infection in between intensive and semi intensive housing system:

130 pigeons for gastrointestinal parasite infection using two different housing systems: intense farming (98 pigeons) and semi-intensive farming (32 pigeons). Watch out for *Ascaridia galli, Capillaria sp., Heterakis gallinarum, and Syngamus trachea*, four distinct gastrointestinal parasites. In intensive rearing 98 number of observation positive number *Ascaridia galli* 36.4% (n=36), *Capillaria sp.* 34.7*% (n=34), Heterakis gallinarum* 17.4*% (n=17), Syngamus trachea* 7.1% (n=7) and In semi intensive rearing positive number of *Ascaridia galli* 40.6% (n=13), *Capillaria sp*. 31.3% (n=10), *Heterakis gallinarum* 15.6% (n=5), *Syngamus trachea* 0 out of 32 pigeon observation . Overall gastrointestinal parasitic infection in intensive rearing was 62.2% (n=51) and in semi intensive rearing 62.5% (n=20) and p-value 0.98.

Table-7: Gastrointestinal parasitic infection in between intensive and semi intensive housing system

Gastro intestinal parasites	Intensive		Semi intensive		Chi square value	p-val ue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	98	51 (62.2)	32	20 (62.5)	<0.00	0.98
Ascaridia galli	98	36 (36.4)	32	13 (40.6)	0.15	0.69
Capillaria sp	98	34 (34.7)	32	10 (31.3)	0.13	0.72
Heterakis gallinarum	98	17 (17.4)	32	5 (15.6)	0.05	0.82
Syngamus trachea	98	7 (7.1)	32	0 (0)	2.42	0.12

4.8. Association of gastrointestinal parasitic infection in between dewormed and not dewormed pigeon:

we looked at 130 pigeons for signs of gastrointestinal parasite infection using two different criteria: dewormed and not dewormed. Of the 130 pigeons, 78 had been dewormed and 51 had not. Watch out for *Ascaridia galli, Capillaria sp., Heterakis gallinarum, and Syngamus trachea*, four distinct gastrointestinal parasites. In 78 observations of dewormed pigeons, there were positive results for *Ascaridia galli, Capillaria sp. Heterakis gallinarum, and Syngamus trachea.* and In not deworming case positive number of *Ascaridia galli* 43.1% (n=22), *Capillaria sp*. 43.1% (n=22), *Heterakis gallinarum* 16.3% (n=8), *Syngamus trachea* 0 out of 51 pigeon observation . Overall gastrointestinal parasitic infection in dewormed pigeon was 53.2% (n=42) and pigeon that not dewormed was 76.5% (n=39) and p-value 0.

Table-8: Gastrointestinal parasitic infection in between dewormed and not dewormed pigeon

Gastro intestinal parasites	Dewormed		Not dewormed		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	79	42 (53.2)	51	39 (76.5)	7.16	<0.00
Ascaridia galli	79	27 (34.2)	51	22 (43.1)	1.05	0.30
Capillaria sp	79	22 (27.9)	51	22 (43.1)	3.24	0.07
Heterakis gallinarum	79	14 (17.3)	51	8 (16.3)	0.02	0.88
Syngamus trachea	79	7 (8.9)	51	0 (0)	4.78	0.03

4.9. Association of gastrointestinal parasitic infection in between cross breed and local breed:

we examined 130 pigeons for gastrointestinal parasite infection using two separate criteria: cross breed and local breed, with 98 pigeons being cross breed and 32 pigeons being local breed. Examine four gastrointestinal parasites*: Ascaridia galli*, *Capillaria sp., Heterakis gallinarum, and Syngamus trachea.* In cross breed pigeons, there were 98 observations with positive *Ascaridia galli* 36.7% (n=36), *Capillaria sp*. 34.69% (n=34), and *Heterakis gallinarum* 17.4% (n=17), *Syngamus trachean* 7.14% (n=7) and In 32number of local breed positive number of *Ascaridia galli* 40.6% (n=13), *Capillaria sp*. 31.3% (n=10), *Heterakis gallinarum* 15.6% (n=5), *Syngamus trachea* 0. Overall gastrointestinal parasitic infection in cross breed pigeon was 62.2% (n=61) and pigeon that local breed was 62.5% (n=20) and p-value 0.

Table-9: Gastrointestinal parasitic infection in between cross breed and local breed

Gastro intestinal parasites	Cross		Local		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	98	61 (62.2)	32	20 (62.5)	<0.00	0.78
Ascaridia galli	98	36 (36.7)	32	13 (40.6)	0.15	0.69
Capillaria sp	98	34 (34.69)	32	10 (31.3)	0.12	0.72
Heterakis gallinarum	98	17 (17.4)	32	5 (15.6)	0.05	0.82
Syngamus trachea	98	7 (7.14)	32	0 (0)	2.42	0.12

4.10. Association of gastrointestinal parasitic infection in between male and female pigeon:

This study we observed 130 pigeon for association of gastrointestinal parasitic infection under two different criteria female and male where 60 pigeon were female and 70 pigeon were male. Observe four different gastrointestinal parasite including *Ascaridia galli, Capillaria sp, Heterakis gallinarum, and Syngamus trachea.* In female pigeon 60 number of observation where positive number *of Ascaridia galli* 40*% (n=24), Capillaria sp*. 35% (n=21), *Heterakis gallinarum* 21.7% (n=13), *Syngamus trachea* 6.7% (n=4) and In case of male pigeon 70 number of positive case *Ascaridia galli* 35.7% (n=25), *Capillaria sp*. 32.9% (n=23), *Heterakis gallinarum* 12.9% (n=9), *Syngamus trachea* 4.3% (n=3). Overall gastrointestinal parasitic infection in female pigeon was 66.7% (n=40) and male pigeon was 58.6% (n=41) and p-value 0.9.

Table-10: Gastrointestinal parasitic infection in between male and female pigeon

Gastro intestinal parasites	Female		Male		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	60	40 (66.7)	70	41 (58.6)	0.90	0.34
Ascaridia galli	60	24 (40.0)	70	25 (35.7)	0.25	0.62
Capillaria sp	60	21 (35.0)	70	23 (32.9)	0.06	0.79
Heterakis gallinarum	60	13 (21.7)	70	9 (12.9)	1.78	0.18
Syngamus trachea	60	4 (6.7)	70	3 (4.3)	0.36	0.54

4.11. Ectoparasitic infection in between intensive and semi intensive housing system:

In this study, 98 pigeons were raised under intensive farming conditions, and 32 pigeons were raised under semi-intensive farming conditions. I observed 130 pigeons for the association of ectoparasitic infection under two separate criteria. Watch out for the four distinct ectoparasites *Lipeurus caponis*, *Collumbicola columbae, Menacanthus straminius,* and *Menopon gallinae. Lipeurus caponis* 30.6% (n=30), *Collumbicola columbae* 35.7% (n=35), *Menacanthus straminius* 12.2% (n=12), and *Menopon gallinae* 19.4% (n=19) were four species with 98 observation positive numbers under rigorous rearing. and In semi intensive rearing positive number of number *Lipeurus caponis* 20.6%(n=20) *Collumbicola columbae* 46.6% (n=15) *Menacanthus straminius* 25% (n=8), and *Menopon gallinae* 25% (n=8). Overall Ectoparasitic parasitic infection in intensive rearing was 58.2% (n=57) and in semi intensive rearing 62.5% (n=20) and p-value 0.98.

Table-11: Ectoparasitic infection in between intensive and semi intensive housing system

Gastro intestinal parasites	Intensive		Semi intensive		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	98	57 (58.2)	32	20 (62.5)	<0.00	0.98
Lipeurus caponis	98	30 (30.6)	32	11 (34.9)	0.15	0.69
Columbicola columbae	98	35 (35.7)	32	15 (46.9)	0.13	0.26
Menacanthus straminius	98	12 (12.2)	32	8 (25.0)	3.28	0.19
Menopon gallinae	98	19 (19.4)	32	8 (25.0)	0.46	0.49

4.12: Ectoparasitic infection in between dewormed and not dewormed pigeon:

we looked at 130 pigeon for association of ectoparasitic infection under two different criteria dewormwd and not dewormed where 79 pigeon were dewormed and 51 pigeon were not dewormed. Observe four different ectoparasite *including Lipeurus caponis, Collumbicola columbae, Menacanthus straminius,* and *Menopon gallinae*. In dewormed pigeon 79 number of observation positive number of *Lipeurus caponis* 27.9% (n=22), *Columbicola columbae* 35.4% (n=28), *Menacanthus straminius* 11.39% (n=9), and *Menopon gallinae* 18.9% (n=15). and In not dewormed pigeon positive number of number *Lipeurus caponis* 37.2% (n=19), *Collumbicola columbae* 43.1% (n=22), *Menacanthus straminius* 21.57% (n=11), and *Menopon gallinae* 23.53% (n=12) out of 51 pigeon's observation. Overall Ectoparasitic parasitic infection in dewormed pigeon was 62.8% (n=32) and in not dewormed pigeon was 76.5% (n=39) and p-value <0.00.

Table-12: Ectoparasitic infection in between dewormed and not dewormed pigeon.

Gastro intestinal parasites	Dewormed		Not dewormed		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	79	32 (62.8)	51	39 (76.5)	7.16	<0.00
Lipeurus caponis	79	22 (27.9)	51	19 (37.2)	1.27	0.26
Columbicola columbae	79	28 (35.4)	51	22 (43.1)	0.77	0.38
Menacanthus straminius	79	9 (11.39)	51	11 (21.57)	3.02	0.22
Menopon gallinae	79	15 (18.9)	51	12 (23.53)	0.39	0.53

4.13. Ectoparasitic infection in between cross breed and local breed:

130 pigeon for association of ectoparasitic infection under two different criteria cross breed and local breed where 98 pigeon were cross breed and 32 pigeon were local breed. Observe four different ectoparasite including *Lipeurus caponis*, *Collumbicola columbae, Menacanthus straminius, and Menopon gallinae*. In cross breed 98 number of observation positive number *Lipeurus caponis* 30.6% (n=30), *Columbicola columbae* 35.7% (n=3), *Menacanthus straminius* 12.2% (n=12), and *Menopon gallinae* 19.3% (n=19). and In local breed positive number of *Lipeurus caponis* 34.3% (n=11) *Columbicola columbae* 46.8% (n=15) *Menacanthus straminius* 25%, (n=8) and *Menopon gallinae* 25% (n=8) out of 32 pigeon observation. Overall ectoparasitic parasitic infection in cross breed was 58.1% (n=57) and in local breed 62.5% (n=20) and p-value 0.67.

Table-13: Ectoparasitic infection in between cross breed and local breed.

Gastro intestinal parasites	Cross		Local		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	98	57 (58.1)	32	20 (62.5)	0.18	0.67
Lipeurus caponis	98	30 (30.6)	32	11 (34.3)	0.15	0.69
Columbicola columbae	98	35 (35.7)	32	15 (46.8)	1.2	0.26
Menacanthus straminius	98	12 (12.2)	32	8 (25.0)	3.2	0.19
Menopon gallinae	98	19 (19.3)	32	8 (25.0)	0.4	0.49

4.14. Ectoparasitic infection in between male and female pigeon:

We observed 130 pigeon for association of ectoparasitic infection under two different criteria female pigeon and male pigeon where 60 pigeon were female and 70 pigeon were male. Observe four different ectoparasite including *Lipeurus caponis*, *Collumbicola columbae, Menacanthus straminius*, and *Menopon gallinae.* In female 60 number of observation positive number of Lipeurus caponis was 23.3% (n=14), *Columbicola columbae* 45.0% (n=27), *Menacanthus straminius* 15.0% (n=9), and *Menopon gallinae* 26.6% (n=16). and In male pigeon positive number of *Lipeurus caponis* 38.5% (n=27), *Collumbicola columbae* 32.8% (n=23), *Menacanthus straminius* 15.7% (n=11), and *Menopon gallinae* 15.7% (n=11) out of 32 pigeon observation. Overall ectoparasitic parasitic infection in female pigeon was 49.3% (n=38) and in male 50.6% (n=39) and pvalue 0.37.

Table-14: Ectoparasitic infection in between male and female pigeon.

Gastro intestinal parasites	Female		Male		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	60	38 (49.3)	70	39 (50.6)	0.77	0.37
Lipeurus caponis	60	14 (23.3)	70	27 (38.5)	3.47	0.05
Columbicola columbae	60	27 (45.0)	70	23 (32.8)	2.01	0.15
Menacanthus straminius	60	9 (15.0)	70	11 (15.7)	0.01	0.91
Menopon gallinae	60	16 (26.6)	70	11 (15.7)	0.36	0.54

4.15. Blood protozoan infection in between intensive and semi intensive housing system:

We looked at 130 pigeon for association of blood protozoal infection under two different criteria intensive and semi intensive housing system where 98 pigeon reared in intensive farming and 32 pigeon reared in semi intensive farming system. Observe two different blood protozoa including *Leucocytozoon* and *Haemoproteus*. In intensive rearing 98 number of observation positive number of *Leycocytozoon* 12.24% (n=12) and *Haemoproteus* 19.4% (n=19) and In semi intensive rearing positive number of *Leucocytozoon* 15.6% (n=5) and *Haemoproteus* 28.1% (n=9) out of 32 pigeon observation. Overall blood protozoal infection in intensive rearing was 31.6% (n=31) and in semi intensive rearing 43.75% (n=14) and p-value 0.21.

Table-15: Blood protozoan infection in between intensive and semi intensive housing system.

Gastro intestinal parasites	Intensive		Semi intensive		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	98	31 (31.6)	32	14 (43.75)	1.57	0.21
Leucocytozoon	98	12 (12.24)	32	5 (15.6)	0.24	0.62
Hemoproteus	98	19 (19.4)	32	9 (28.1)	1.09	0.29

4.16. Blood protozoan infection in between dewormed and not dewormed pigeon:

we observed 130 pigeon for association of blood protozoal infection under two different criteria dewormed and not dewormed where 79 pigeon were dewormed and 51 pigeon were not dewormed. Observe two different blood protozoa including *Leucocytozoon* and *Haemoproteus*. In 79 number of dewormed pigeon positive number of Leycocytozoon 17.7% (n=9) and *Haemoproteus* 19.6% (n=10) and In 51 number of pigeon those were not dewormed positive number of *Leucocytozoon* 10.1% (n=8) and *Haemoproteus* 22.8% (n=18). Overall blood protozoal infection in dewormed pigeon was 37.3% (n=19) and in not dewormed pigeon was 32.9% (n=26) and p-value 0.61.

Table-16: Blood protozoan infection in between dewormed and not dewormed pigeon.

Gastro intestinal parasites	Dewormed		Not dewormed		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	79	19 (37.3)	51	26 (32.9)	0.26	0.61
Leucocytozoon	79	9 (17.7)	51	8 (10.1)	1.54	0.21
Hemoproteus	79	10 (19.6)	51	18 (22.8)	0.19	0.67

4.17. Blood protozoan infection in between cross breed and local breed:

This study we observed 130 pigeon for association of blood protozoal infection under two different criteria cross breed and local breed where 98 pigeon were cross breed and 32 pigeon were local breed. Observe two different blood protozoa including *Leucocytozoon* and *Haemoproteus*. In 98 number of cross breed pigeon. positive number of *Leycocytozoon* 12.2% (n=12) and *Haemoproteus* 19.4% (n=19) and In 32 number of local breed positive number of *Leucocytozoon* 15.6% (n=5) and *Haemoproteus* 28.1% (n=9). Overall blood protozoal infection in cross breed pigeon was31.6% (n=31) and in local breed pigeon was 43.8% (n=14) and p-value 0.21.

Table-17: Blood protozoan infection in between cross breed and local breed.

Gastro intestinal parasites	Cross		Local		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	98	31 (31.6)	32	14 (43.8)	1.57	0.21
Leucocytozoon	98	12 (12.2)	32	5 (15.6)	0.24	0.62
Hemoproteus	98	19 (19.4)	32	9 (28.1)	1.09	0.29

4.18. Blood protozoan infection in between male and female pigeon:

This study we observed 130 pigeon for association of blood protozoal infection under two different criteria female and male pigeon where 60 pigeon were female and 70 pigeon were male. Observe two different blood protozoa including *Leucocytozoon* and *Haemoproteus*. In 60 number of female pigeon positive number of *Leycocytozoon* 10.0% (n=6) and *Haemoproteus* 20.0% (n=12) and In 70 number of male positive number of *Leucocytozoon* 15.7% (n=11) and *Haemoproteus* 22.9% (n=16). Overall blood protozoal infection in female pigeon was 30.0% (n=18) and in male pigeon was 38.6% (n=27) and p-value 0.31.

Table 18: Blood protozoan infection in between male and female pigeon.

Gastro intestinal parasites	Female		Male		Chi square value	pvalue
	Number of observation	Number positive N (%)	Number of observation	Number positive N (%)		
Overall parasitic infestation	60	18 (30.0)	70	27 (38.6)	1.05	0.31
Leucocytozoon	60	6 (10.0)	70	11 (15.7)	0.92	0.33
Hemoproteus	60	12 (20.0)	70	16 (22.9)	0.16	0.69

CHAPTER-V

DISCUSSION

5.1. Discussion on overall prevalence of gastrointestinal parasites and prevalence associated with housing, deworming, sex and breed:

The current study was done on pigeons in different farm of Chattogram metropolitan area during July 1, 2022 and December 31, 2022. Small-scale farmers who kept pigeons for economic or aesthetic reasons had their birds' feces collected and analysed during the study time. There are simple flotation methods, direct smear methods, and sedimentation methods used in the lab test. The pigeon exhibited diarrhoea and weight loss in addition to emaciation when it had a significant infestation of multiple worms, both of which are symptoms of worms. Worms can also cause emaciation. Young birds that are infected develop more slowly. While others of the birds had numerous infections, some of the birds only had a single one.

A total of 81 samples out of 130 were discovered to contain one or more species of GI parasites. The frequency of GI parasites was only examined individually and globally; seasonally, it was not shown. *Ascaridia sp., Capillaria sp.,* and *Hetrakis sp*., in addition to *syngamus trachea*, were found to be the species of parasites that were discovered in this research. There was a 37% prevalence of *Ascaridia sp.*, a 33.8% prevalence of *Capillaria sp.*, a 17% prevalence of *heterakis*, and a 5.4% prevalence of *Syngamus trachae*. Based on these findings, it appears that *Ascarida* nematode infection is more prevalent in pigeons than *Capillaria* nematode infection, but both are extremely detrimental to pigeon health and should be eradicated. .The overall prevalence of gastro intestinal parasites was 62.31% in the present research, which is consistent with the findings of Marques et al. (2007). However, Parsani and Momin (2010) and Begum and Shaikh (1987) found 88.88% and 86% nematodal infestation in pigeons, respectively, which were higher than the current research. *Ascaridia galli* (37%) was more common than other gastro intestinal parasites among the four species, which is consistent with the results of Rabbi et al. (2006). The eggs of *A. galli* can sustain a direct life cycle without the assistance of an earthworm and are resistant to common disinfectants. (Soulsby, 1982).

Heteroakis is harmful and produces harm prevalence is 17% Similar to found by Rabbi et al. 19 and slightly higher than what was found in India by Sivajothi and Reddy 20. The previous results were supported by the low prevalence of *Capillaria sp.* infection (33.8%) compared to *ascridia* and Similar to *Capilaria sp*. occurance was much lower than Rabbi et al.'s finding,19. In the current research, the rates of infection with *Ascaridia* and *Capillaria* were 37% and 33.8%, respectively. These figures are higher than those reported by Adang et al. 10 and almost identical to those reported by Borghare et al. 21. The previous study documented the occurrence of *ascaridia* (32%) and *capillaria* (26%) infections in pigeons. The lowest prevalence of *Syngamus trachea* (5.4%) was observed in the present study which agrees with the findings of **Sari *et al.* (2008)**. In this study gastrointestinal parasites are more prevalent in semi intensive farming system than intensive farming system and chi square analysis hold that no significant change in gastrointestinal parasitic infestation in cause by rearing system (intensive and semi intensive housing). (Table-7). Usually the bird rearing intensive system gives more care and semi intensive farming are more prone to infections due to their more access to outside environment. On the other hand this difference can be caused due to unequal number of observation in both category. In dewormed and not dewormed investigation not dewormed bird are more prevalent that dewormed. (Table-8). overall prevalence <0.00 is significant in not dewormed bird and *Capillaria sp* and *syngamus trachea* also significant according to Msoffe et al (2010). In this study of Local and cross breed there is no significant prevalent rate. (Table-9). Possibility of showing this result because of difficult to determine blood percentage of foreign or cross breed from local breed and possibility of mixing cross breed with local breed due to lack of record keeping in farm. (Table-9). In sex related study male bird are more prevalent than female bird According to the report of Tanveer et al (2011) (Table-10). Statistically there was no significant difference (P>0.05) observe in the prevalence of gastrointestinal parasite in male and female domestic pigeon. The current investigation also documented cases of mixed parasitic illnesses. The establishment of a mixed or single infection may depend on the type of food most preferred at a given moment. Factors such as diet, geography, climate, and access to intermediate hosts can all influence the prevalence of parasitic infections in pigeons. In our country, pigeons are typically raised in a semi-scavenging or scavenging system. Due to their continuous contact with the soil, these birds serve as a reservoir for helminths transmitted by the soil.

5.2. Discussion on overall prevalence of Ectoparasites and prevalence associated with housing, deworming, sex and breed:

It has been demonstrated in (Table-4) that there is a correlation between the phases and ages of pigeons and the presence of ecto and GI parasitic infections. During the course of this investigation, four different species of ectoparasites were discovered, and the investigation revealed that the prevalence of ectoparasites was 59.2% altogether. *Lipeurus caponis* caused the most infection (38.5%). The most common species were *Columbicola columbiae* (31.5%), *Menopon gallinae* (23.1%), and *Menacanthus stramineus* (15.4%). *Menacanthus straminius* accounted for only 15.4 percent of pediculosis cases. On the other hand, the infections caused by ectoparasites was found to be 59.2% (either a single infection or a mixed infection). (Fig. 4.4). According to this observation, ectoparasites are more common in semi-intensive farming systems than in intensive farming systems, and a P value analysis reveals that neither kind of housing (intensive or semi-intensive) has a significant impact on ectoparasitic infection. (Table-11). Because they have more access to the outside environment, semi-intensive farming is typically more susceptible to illnesses than intensive bird rearing systems. In another cause, this disparity may be the result of an uneven distribution of observations between the two categories. In a study comparing birds that have been dewormed and those that have not, the non-dewormed birds are more common found in this (Table-12) and it was similar to the report of Msoffe et al. (2010). overall prevalence 0.00 is significant in not dewormed birds, and *Lipeurus caponis, Menacanthus straminius* and *Columbicola columbae* are more significant. In possibility of showing this result because of difficult to determine blood percentage of another study of Local and cross breed there is no significant prevalent rate (table-12). Foreign or cross breed from local breed and possibility of mixing cross breed with local breed due to lack of record keeping in farm (Table-13). In sex related study male bird are more prevalent than female bird. (Table-14). According to the report of Tanveer et al (2011), Statistically there was no significant difference ($P>0.05$) observe in the prevalence of ectoparasite in male and female domestic pigeon. The present investigation identified four distinct types of ectoparasitic infections in the study population. These infections belong to four different species, including lice, ticks, and mites.

5.3. Discussion on overall prevalence of blood protozoa and prevalence associated with housing, deworming, sex and breed:

In this research, 130 pigeons were examined, and n(30) 34.1% of the birds had blood protozoa (Table-5). Gulanber et al.'s (2002) study, which found that 43.2% of pigeons have blood protozoa, confirmed this finding. The most common types of protozoa that have been found are *haemoproteus* species 21.50% and *leucocytozoon* species 13.10% (Table5). Studies that were very similar to one another were carried out by Sinlik et al., (2005) and Raharimanga et al., (2002). These researchers discovered that 21.1% and 19.9% of the birds in the Bursa region and Madagascar, respectively, were contaminated with *Haemoproteus*. In Batswana, Uganda, and Nigeria, respectively, Mushi et al., (2000), Dranzoa et al., (1999), and Orajaka and Nweze (1991) reported that 82%, 76.5%, and 37.5% of pigeons are positive for *Haemoproteus*. However, this finding differed from the findings of these other researchers. This disparity in findings between the current research and those of the past may be attributable to differences in the methodology of the studies, the abundance of the intermediate host, and the management system. In contrast, Valkiunas et al. (2003) and Bennet et al. (1992) found a 2%, 4.6%, and 8.3% prevalence of *Leucocytozoon sp*. It's possible that pigeon husbandry methods, intermediate host availability, and climatic conditions all played a role in the current study's finding of a reduced prevalence rate. The percentage of male birds for *Haemoproteus* 22.9% and *Leucocytozoon* 15.7%, while the percentage of female birds for *Haemoproteus* 20% and *Leucocytozoon* 6%. Blood protozoa are more common in semi intensive farming systems than in intensive farming systems, according to this finding, and a P value analysis suggests that neither kind of housing (intensive or semi-intensive) has a significant impact on Blood protozoan infection. (Table-15). Semi-intensive farming is more prone to infections than intensive bird rearing methods because it has more access to the outside environment. Another reason for the gap could be an uneven distribution of observations between the two categories. In a research comparing dewormed birds to nondewormed birds, the non-dewormed birds were shown to be more numerous According to Msoffe et al. (2010) (Table-16). The true reason of increased parasite infection is unknown. Female sex hormones, on the other hand, are related with a decreased mean parasite burden (Ackert and Dewhirst, 1950; Todd and Hollingsworth, 1951). This phenomenon could explain why females have a reduced prevalence of haemoprotozoa infection. According to Hillgarth and Wingfield (1997), a higher amount of testosterone

(sex related hormone) makes a pigeons (male) more susceptible to illnesses.(Table-18)

Both *Haemoproteus sp.* and *Leucocytozoon sp.* were found to be present in RBC and lymphocytes, respectively, during the course of this research. In the instance of *Haemoproteus sp,* the gametocyte was discovered in RBC. This gametocyte was found to be elongated, had the shape of a crescent, and was found to partially encircle the nucleus of the host cell. Giemsa's stain gave off a lavender hue when it was applied to the gametocyte. Within the lymphocyte, elliptical macrogametes of *Leucocytozon sp* were observed, and they stained dark blue with Giemsa's stain. Comparing this description to that of Soulsby (1982) for *Haemoproteus columbae* and *Leucocytozoon sp*, it's striking how similar they are. Due to the lack of relevant studies, it was impossible to make a comparison with this finding. It is no possible to explain the actual cause of the increased prevalence of parasitic infection.

CHAPTER-VI

CONCLUSION

Pigeons were moderately infested with gastro-intestinal, ectoparasites and blood protozoa according to the findings of this study. *Ascaridia sp., Capillaria sp., Heterakis sp.,* and *Syngamus trachae* had respective prevalence rates of 37, 33.8, 17, and 5.4%. *Ascaridia sp*. is thus the primary danger of pigeon intestinal nematode. *Capillaria sp.* poses a lower danger than *Ascaridia sp.*, and *Syngamus trachea* poses a lower threat than *Heterakis sp.* in the experimental area. Overall, 59.2% of pigeons were infected with ectoparasites. *Lipeurus caponis,* one of four ecto-parasites, was responsible for the greatest infection (38.5%). *Columbicola columbae* (31.5%) and *Menopon gallinae* (23.1%) were found to be more prevalent cases of pediculosis in the study population as compared to *Menacanthus straminius,* which made up the smallest percentage at 15.4%. It was also discovered that pediculosis was a common problem in the population under investigation. These parasitic infections have the potential to result in significant financial losses to the poultry business. The preliminary state of the pigeons' gastro-intestinal parasitic infestation in the Chattogram district was revealed by this research. It should be useful for Bangladesh's Department of Livestock Service in developing successful control programmes against parasitic pigeon disease.

The results of this research allow for the possibility of drawing the conclusion that 23.1% of pigeons were infected with two different types of blood protozoa, namely *Haemoproteus sp.* (13.1%) and *Leucocytozoon sp.* (10%), and that the developmental stage of *Haemoproteus sp.* was also identified in the vector fly, *Pseudolynchia canariensis (90%).*

CHAPTER-VII

RECOMMENDATION

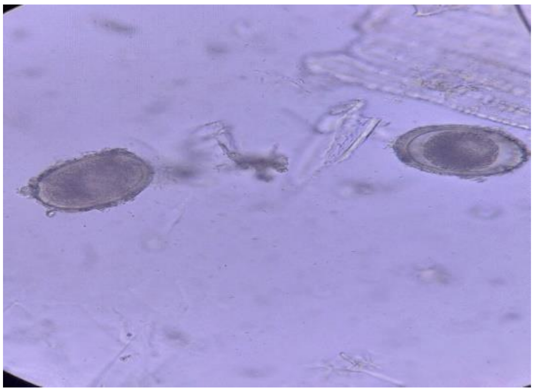
My recommendation for controlling the protozoan infestation of pigeon is to maintain the sufficient hygienic measure taken of the flock, provide fresh feeds to the pigeon There are many antiparasitic drugs that need to be used to treat pigeons with parasites. It has been suggested that additional research into the identification of protozoa should be carried out; however, it would be preferable if a sero surveillance could be carried out instead. The findings of the sero surveillance would provide some insight into the prevalent status of the disease.

ANNEX-1

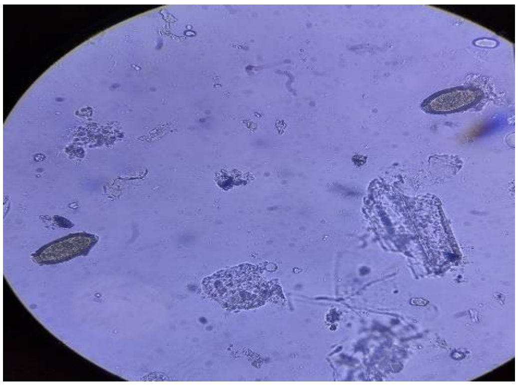
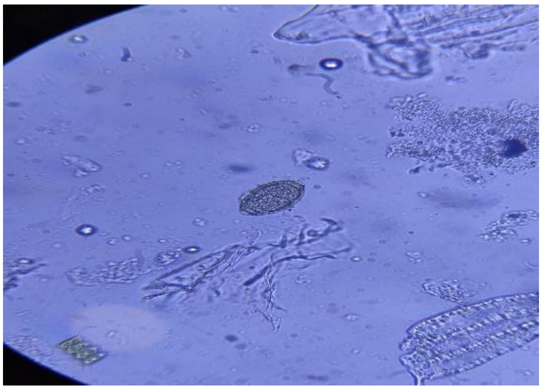
Pictorial presentation during collection and examination of fecal sample

ANNEX-2

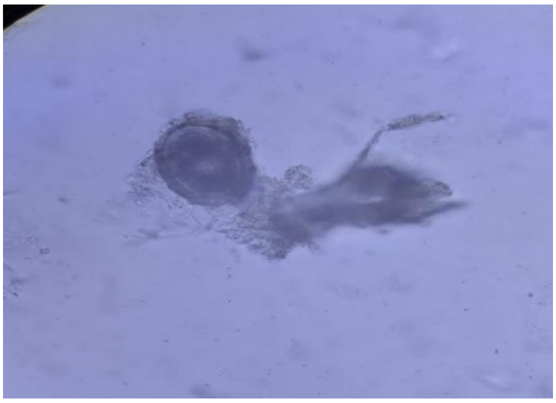
Different types of Egg in Microscopic Examination:




Egg of *Ascaridia galli*

Egg of *capillaria sp*



Egg of *Heterakis*

Egg of *Syngamus trachae*

ANNEX-3

Pictorial presentation of collection and examination and different type of ectoparasites under microscope:

External Examination of Ectoparasites   Examination under microscope

Lipeurus caponis

Menopon gallinae

Columbicola columbae

Menacanthus stramineus

ANNEX-4

Pictorial presentation of collection of blood and preparation of blood smear:

Collection of blood

Preparation of thin smear

Air drying

Staining with Giemsa stain

Add Immersion oil

Observe under microscope

ANNEX-5

Microscopic Examination of Blood Protozoa:

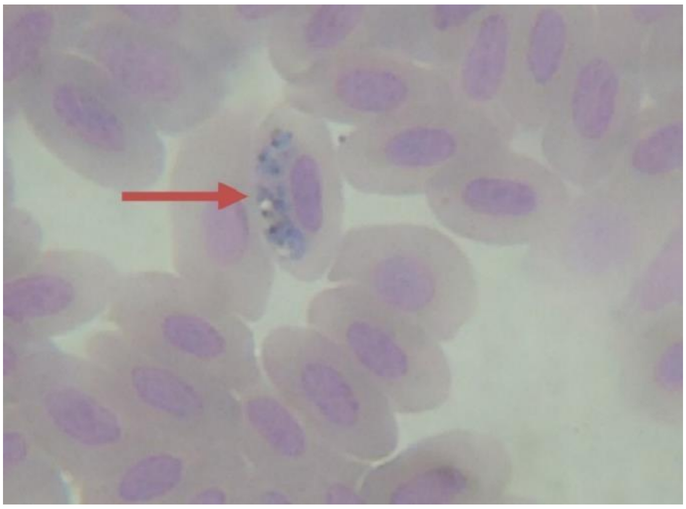


Fig: Macrogamete of *Haemoproteus sp* within RBC in pigeon, Stained with Giemsa stain.

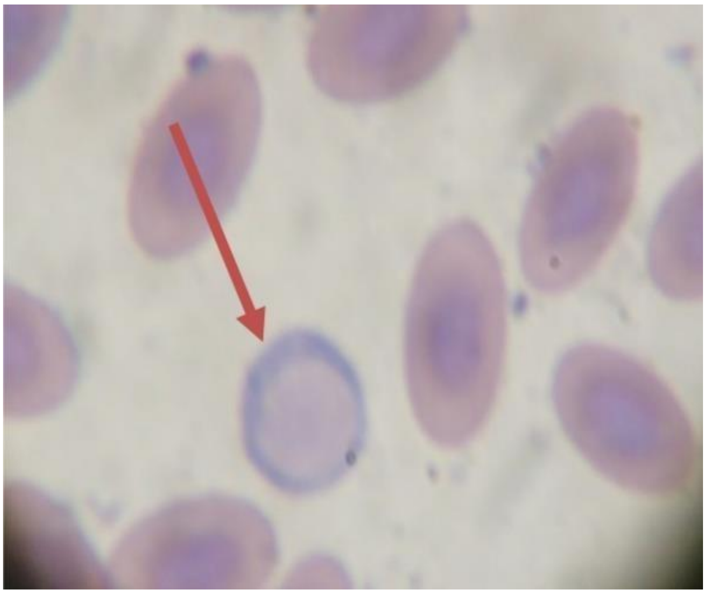


Fig: *Leucocytozoon sp* infected lymphocyte in blood film

CHAPTER-VIII

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ANNEX-6

QUESTIONNAIRE:

General Informaions:

Owner's name:

Address:

Village: upazilla: Zilla:

Educational status:

Case Information:

Herd size:

Breed: Local/Cross/Specific…………….

sex: M/F

Age:

Housing:

Types: Intensive/ semi intensive/extensive

Floor type: Bricks/concrete/soil/Wood bed 11. litter types: No/Rubber bed/jute bag/straw/Others **Health and Deworming Status** :

Anthelmentic: Yes/No

Types:

Last dose when given:

Previous parasitic infection history by coproscopy: Yes/No

Fecal Consistency: Firm/Soft/Liquid

Color of feces: Normal/Bloody/yellowish/others

Concentrared Feed: Yes/ No

Types:………………….

vit-min premix: yes/No

Amount:………………………

Brief Bio-data

Md. Moazzem Hasan Mamun, was born on 7 August 1995 in the Rangpur district of Bangladesh. He is the son of Md. Abdul Awal and Most. Monoara Begum. He passed Secondary School Certificate (SSC) Examination in 2011 from Pirgachha J N High School, Rangpur and Higher Secondary School Certificate (HSC) Examination in 2013 from Rangpur Government College, Rangpur He obtained his Doctor of Veterinary Medicine (DVM) degree in 2019 from Chattogram Veterinary and Animal Sciences University (CVASU). He did his clinical training in Veterinary Clinical Medicine from Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), India in the year of 2019. Now, he is a candidate for the Master Degree in Parasitology under the Department of Pathology and Parasitology, Faculty of Veterinary Medicine, CVASU. The author got NST Fellowship for his MS research.