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Prevalence of blood protozoa in poultry in Tangail, Bangladesh

Md. Abdul Momin, Nurjahan Begum, Anita Rani Dey*, Md. Shah Paran and Mohammad Zahangir Alam

(Department of Parasitology, Bangladesh Agricultural University, Bangladesh)
Department of Parasitology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.

Abstract: *The present study was undertaken in different areas of Tangail district to investigate the presence of haemosporidian parasites in domestic poultry (Chicken, duck and pigeon). A total of 72 samples were examined from December, 2013 to May, 2014. Microscopical examinations of peripheral blood were performed. Among the examined samples, 33(45.8%) poultry were found to be infected with different blood protozoa. Two species of blood protozoa were identified such as Leucocytozoon spp. in chickens (34.6%) and ducks (58.3%); Haemoproteus spp. (22.7%) and Leucocytozoon spp. (22.7%) in pigeons. Female (46.5%) were 1.10 times more susceptible than male (44.8%) which was statistically significant (P<0.01). The overall prevalence of young birds was 17.39% while in adults 59.18% and this variation was statistically significant (P<0.05). According to calculated odds ratio, adults were 6.89 times more susceptible than the youngs. From the findings of this study it is concluded that haemosporidian parasitic infection in poultry is prevalent in Bangladesh. Therefore, more epidemiological studies are necessary to know the exact situation of haemosporidian parasites in poultry of Bangladesh.*

Key words: *Prevalence, blood protozoa, poultry, Bangladesh,*

I. Introduction

Avian haemoprotozoa are intracellular blood parasites that are transmitted by blood sucking insects including **s**imulidae (black flies), mosquitoes, biting midges (*Culicoides)* etc. Many recent studies have focused on avian blood parasites as a model system for host-parasite interactions in an evolutionary and ecological context [1-5]. The disease is prevalent in areas with a suitable ecology and ethology of invertebrate hosts, simuliid flies and culicoid midges [6]. Avian malaria and related haemosporidians (*Haemoproteus*, *Leucocytozoon* and *Plasmodium*) are widespread, abundant and diverse and are easily sampled without disrupting the host populations. The prevalence of *Leucocytozoon* is 16% in domestic poultry in Iran. In one survey, 13.6% of backyard chickens in South Carolina, USA were infected with *Leucocytozoon caulleryi* [7]. *Haemoproteus* (4.8%), *Plasmodium* (0.6%) and *leucocytozoon* (0.3%) were also reported in north western Costa Rica [8]. The prevalence of *Haemoproteus columbae* was 21% in pigeon. The highest infection rate was observed in autumn (44%) while the lowest in spring in Iran [9]. *Leucocytozoon* (5.5%), *Haemoproteus* (3.6%) and *Plasmodium* (20.0%) are also prevalent in wild birds in Tsushima Island of Japan [10]. Infections with multiple species and genera of haematosporidia are common [11-13]. Although, *Leucocytozoon*, *Haemoproteus* and *Plasmodium* species have been implicated in disease outbreaks [14]. Malaria parasites are supposed to have strong negative effects on host fitness because this intra-cellular parasite causes dramatic reductions in the efficiency of metabolism [15]. Ultimately, bird can lead to progressive weakness, declines in food consumption and activity levels, loss of up to 30% body weight [16] and eventually, death. [17] studied the role of blood parasites as a potential source of physiological stress for avian hosts in the wild. Previously, blood parasites were considered low pathogenic organisms [14] in spite of them causing disease and death in captive birds. Only a few published reports are available on haemoprotozoan infection in Bangladesh [18-20]. Therefore, the present study was designed to investigate the prevalence of blood protozoa in poultry and to correlate the effect of host's sex on the prevalence of blood protozoa.

II. Materials And Methods

2.1 Research area and duration

Blood samples were collected from different villages of Tangail district during the period of December, 2013 to May, 2014.

2.2 Sample collection

Seventy two birds (26 chickens, 24 ducks and 22 pigeons) were collected randomly irrespective of age, sex and health condition from local market and directly from farmer's house of different villages of Tangail

district. Peripheral blood samples were collected from the wing vein with the help of syringe and needle and taken in a vial with sufficient Ethylene Diamine Tetra Acetic acid (EDTA) and kept in refrigerator.

2.3 Ante-mortem examination

After collection of birds age and sex were recorded in accordance with the history from the owners. According to sex, birds were divided into male and female. Birds were further divided into young (6 months ≤) and adult (≥ 6 months) in accordance with age.

2.4 Preparation of blood smears and identification of protozoa

A thin smear was made immediately after the collection of blood. The smears were then air dried, fixed with absolute acetone free methyl alcohol, stained with Giemsa's stain and air dried [21]. 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 [6], [22], [23].

2.5 Statistical analysis

To compare the prevalence of blood parasites in relation to sex and age, data were analyzed by using paired sample t-test and Chi-square test [24]. To determine the level of susceptibility of male and female pigeon, odds ratio (OR) was calculated according to the formula given by [25].

III. Results and Discussion

3.1 Overall prevalence of blood protozoa in poultry in Tangail

During this study, a total of 72 birds (26 chickens, 24 ducks and 22 pigeons) were examined of which 33 (45.8%) birds were infected with different blood protozoa. Two species of blood protozoa were identified such as *Leucocytozoon* spp. in chickens and ducks, *Haemoproteus* spp. and *Leucocytozoon* spp. in pigeons (Table 1). More or less similar results were reported by [26] in the central Philippine islands (42%).The lower prevalence was recorded by [27] in three regions of Asia (34.0%), [28] in wetland birds in Bangladesh (29.5%), [29] in Equatorial Guinea and Ivory Coast (28.6%) and [30] in northeastern Mexico (12.8%). These variations among the present and previous studies may be due to the differences in geographic niches, climatic conditions, breed of birds, management factors, availability of vectors and the method of study. In this study, only backyard poultry were included and their management was relatively poor. They are frequently infested by various arthropods. In fact, *Pseudolynchia canariensis* [19], *Simulium* sp. and *Culicoides* sp. are abundant in Bangladesh. They act as potential vector of blood protozoa of poultry. Probably these factors play a vital role in the high prevalence of blood protozoa in backyard poultry in Bangladesh.

3.3 Sex related prevalence of blood protozoa in poultry in Tanggail

In this study, the overall prevalence of male bird was 44.8% while in female 46.5% which was statistically significant ($P<0.01$). The calculated odds ratio showed that male were 1.10 times more susceptible than the female (Table 2). This finding is more or less the agreement of [9] who reported that 45% male and 55% female pigeon were infected with blood protozoa in Bursa region (USA). According to [31] in Missouri (U.S.A.) and [32] in Atlantic Flyway, there were no significant differences in the prevalence of blood protozoa in male and female ducks. Higher rate of infection is recorded by [33] in India (62.79% and 57.65%) and [34] in Turkey (62.5% and 52.6%) in female and male pigeon, respectively. [19] reported the lower prevalence in pigeons in different areas of Bangladesh. The exact cause of higher haemoprotozoan infection in the females cannot be explained but in general higher level of prolactin and progesterone suppress the immune system of the individual and make the female individual more susceptible to any infection [35].

3.4 Age related prevalence of blood protozoa in poultry in Tangail

In the present study, adults (59.2%) were 6.89 times more susceptible young birds (17.4%) which was statistically significant($P<0.05$). Prevalence of parasite according to species was shown in Table-3. Similar results were recorded by [36] in Tanzania (63% and 11%) and [37] in Egypt (60.7% and 20%) in adult and young pigeons, respectively. But, [9] and [34] reported the higher prevalence in Bursa region of USA (69% and 31%) and Turkey (63.5% and 47.5%) in adult and young pigeons, respectively. The lower prevalence was reported by [18] in different areas of Netrokona and Mymensigh districts of Bangladesh (33.33% in adults and3.51% in young) and [31] in Missouri of USA (18% in adults and 2% in young) in pigeons and wood ducks, respectively**.**

IV. Figures and Tables

Table 1. Overall prevalence of blood protozoa in different poultry

Hosts	Name of Protozoa	Prevalence (%)	P value
Chicken (n=26)	Leucocytozoon spp.	9 (34.6%)	0.002**
Duck (n=24)	Leucocytozoon spp.	14 (58.3%)	
Pigeon (n=22)	Haemoproteus spp.	5 (22.7%)	
	Leucocytozoon spp.	5 (22.7%)	
Overall (n=72)	-	33 (45.8%)	

Legend:

*** * = P < 0.01(1% level of significant)**

Table 2. Sex related prevalence of blood protozoa in different poultry

Hosts	Sex	Name of Protozoa	Prevalence (%)	P value	Odds ratio
Chicken (n=26)	Male (12)	Leucocytozoon spp.	3 (25%)	0.010**	-
	Female (14)	Leucocytozoon spp.	6 (42.9%)		
Duck (n=24)	Male (6)	Leucocytozoon spp.	4 (66.7%)	0.012**	-
	Female (18)	Leucocytozoon spp.	10 (55.6%)		
Pigeon (n=22)	Male (11)	Haemoproteus spp.	2 (18.2%)	0.003**	-
		Leucocytozoon sp.	4 (36.4%)		
	Female (11)	Haemoproteus spp.	3 (27.3%)		
		Leucocytozoon spp.	1 (9.1%)		
Overall (n=72)	Male (29)	-	13 (44.8%)	0.0051**	1.10
	Female (43)	-	20 (46.5%)		

Legend:

*** = P < 0.05 (5% level of significant)**

Table 3. Age related prevalence of blood protozoa in different poultry

Hosts	Parameter	Name of Protozoa	Prevalence (%)	P value	Odds ratio
Chicken (n=26)	Young (10)	Leucocytozoon spp.	2 (20%)	0.005**	-
	Adult (16)	Leucocytozoon spp.	7 (43.8%)		
Duck (n=24)	Young (7)	Leucocytozoon spp.	2 (28.6%)	0.0029**	-
	Adult (17)	Leucocytozoon spp.	12 (70.6%)		
Pigeon (n=22)	Young (6)	Haemoproteus spp.	0 (0.0%)	0.417NS	-
		Leucocytozoon spp.	0 (0.0%)		
	Adult (16)	Haemoproteus spp.	5 (31.3%)		
		Leucocytozoon spp.	5 (31.3%)		
Overall (n=72)	Young (23)		4 (17.4%)	0.037*	6.89
	Adult (49)		29 (59.2%)		

Legend:

*** = P < 0.05 (5% level of significant)**

*** * = P < 0.01(1% level of significant)**

NS = Not significant

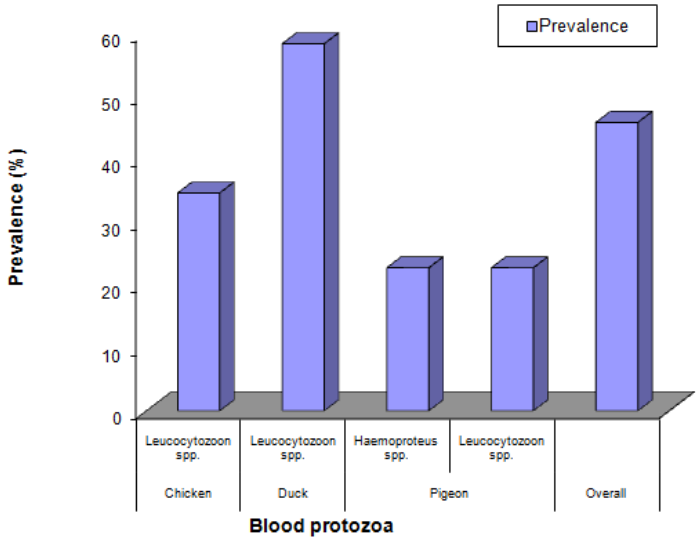

Figure 1. Overall prevalence of blood protozoa in different poultry

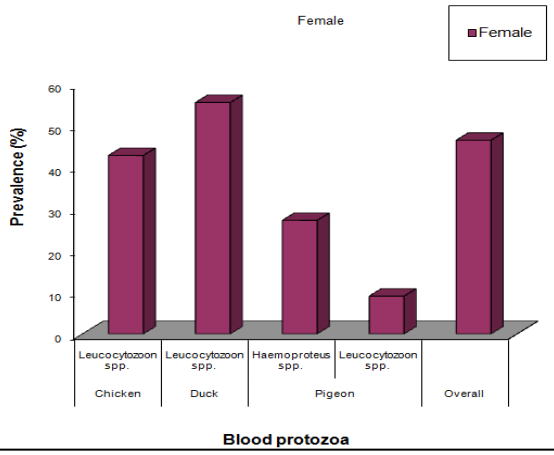

Figure 2. Sex related prevalence of blood protozoa in different poultry

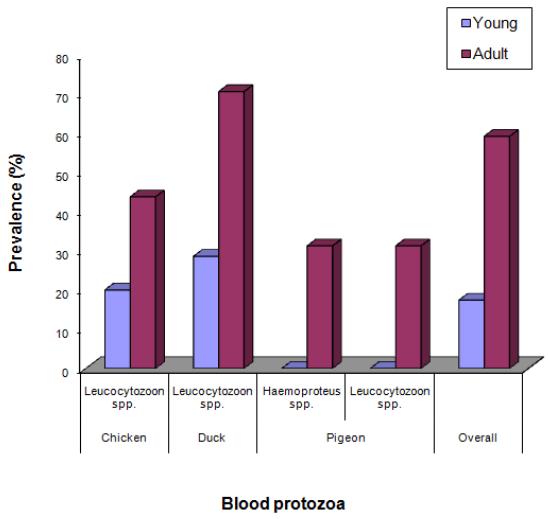

Figure 3. Age related prevalence of blood protozoa in different poultry

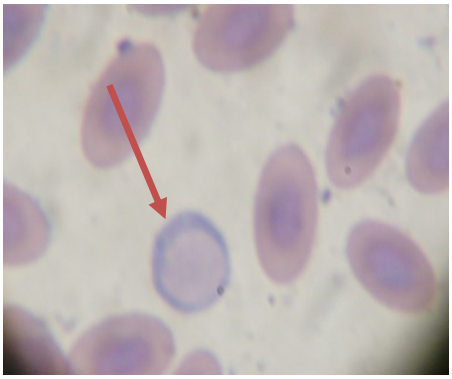

Figure 4. *Leucocytozoon* spp. (arrow) infected lymphocyte in the blood film of Chicken stained with Giemsa's stain (825X)

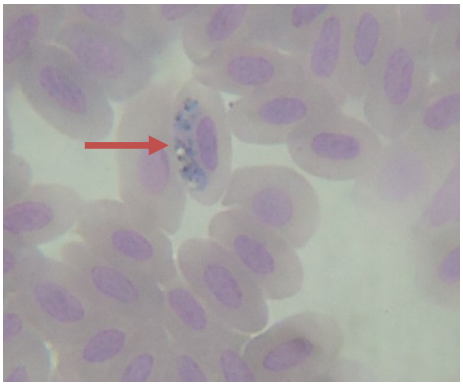

Figure 5. Macrogamete of *Haemoproteus* spp. (arrow) within RBC in pigeon, stained with Giemsa's stain (825X)

V. Conclusions

Haemosporidian parasitic infection in poultry is prevalent in Bangladesh. The variation in the prevalence of parasites in relation to their age and sex were investigated. The seasonal dynamics on prevalence of these parasites were not studied which would be more helpful in the planning of a control measures against blood protozoa in poultry. Therefore, more epidemiological studies are necessary to know the exact situation of haemosporidian parasites in poultry of Bangladesh.

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