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Bacterial Diseases of Poultry Prevailing In Bangladesh

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Abstract: A study was conducted to determine the incidence of diseases in various age groups of 10 different flocks of birds from 5 different poultry farms in some selected areas of Bangladesh. The diseases were diagnosed based on history,signs and symptoms prior to death,lesions observed after post mortem examination of dead birds and by bacteriological examinations. A total 8169 dead chickens (2960 chicks, 1083 grower and 4126 adults) were examined. Related samples like liver, spleen and intestine were collected and were cultured on different bacteriological agar media. Among bacterial diseases salmonellosis was found in 53.90% of chicks (group 1) followed by omphalitis in 28.42%, colibacillosis in 13.36%, mycoplasmosis in 2.55%, necrotic enteritis in 1.18% and infectious coryza in 0.59%. The bacterial diseases salmonellosis, colibacillosis, infectious coryza and necrotic enteritis were detected in 55.96, 11.93, 29.91 and 2.20% of group 2 (growers), respectively. Omphalitis disease was never found in grower. Mycoplasmosis was not found in group 2. Salmonellosis was found in 53.32% of adult chicken followed by mycoplasmosis in 39.09%, infectious coryza in 6.11% and necrotic enteritis in 1.48%. Omphalitis was also not found in this group. This group was also not affected by colibacillosis.

Key words: Bacterial diseases, chickens, incidence, poultry

INTRODUCTION

Poultry farming in Bangladesh are getting momentum during the last two decades. This is highly sensitive and risk oriented venture. Good scientific knowledge is needed to run it satisfactorily and profitably. Poultry farmers in Bangladesh are confronted with a wide range of poultry diseases. These poultry diseases may occur singly or in combination and lessen the optimal production of flocks. During the last few years a good number of poultry diseases and variants of existing infections have been observed in Bangladesh. Major bacterial diseases that cause serious economic loss to the commercial poultry include salmonellosis, omphalitis, colibacillosis, infectious coryza and mycoplasmosis which are prevailing in Bangladesh. Among these,salmonellosis is of significance because the causal agents of salmonellosis are transmitted vertically from parent to offspring. Salmonellosis has been found to be a major infectious disease of all ages of poultry. The importance of salmonellosis in poultry production has increased worldwide during the last past of previous century. It is a problem of economic concern to all phases of the poultry industry from production to marketing. There are two types of *Salmonella* species namely, *S. gallinarum* and *S. pullorum* that cause the fowl typhoid and the pullorum disease, respectively. These bacteria can not cause diseases neither in humans nor in animals (with exception of very special circumstances). Therefore, these are out of interest for the public health. These two species of *Salmonella* however, are very important in view of poultry health because they are responsible for massive losses not only in the infected flocks but also in the progeny.

The economic importance of the diseases are more important in parts of the countries where poultry, are beginning to intensify their industry, such as countries in South and Central America, the Middle East, the Indian subcontinent and parts of Africa (Pomeroy, 1984). Domestic poultry constitute the largest single reservoir of *Salmonella* organism existing in nature. Among all animal species the *Salmonella* are most frequently reported from poultry and poultry products (Barrow, 1993).

MATERIALS AND METHODS

This study was conducted observing and taking samples mainly from the Dhaka, Norsingdi, Gazipur,

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Mymensingh and Tangail districts of Bangladesh. These areas were selected on the basis of poultry population and closeness to Central Disease Investigation Laboratory (CDIL) Department of Livestock Services (DLS) Bangladesh, Dhaka, Jahangirnagar University (JU) and Bangladesh Agricultural University (BAU) which were the working stations of my study. Both parent stock breeder and commercial layer chickens flocks were examined. Each flock of chicken was divided into 3 groups based on age: Group 1 (chick): 0-8 weeks, Group 2 (grower): 9-20 weeks, Group 3 (adult): 21-78 weeks.

Flocks selection and their maintenances: Eight flocks of commercial layer chickens and 2 flocks of breeder parent stocks were reared separately in open sided cage system poultry houses in 5 selected poultry farms. The birds were feed with same formulation of commercial feed containing no antibiotics or growth promoters based on age groups. All the flocks of birds were dewormed at the prelaying period of 18 weeks of age. Strict sanitation and hygienic measures were maintained for all flocks. Routine vaccination schedules were maintained.

For the prevention of bacterial diseases, antibiotics were administered in drinking water for consecutive 5 days for all selected flocks of birds. The daily management of the chickens,house and environment was as practiced in conventional commercial layer and breeder parent stock farming. Feeding and watering were *Ad libitum* for all birds. The balance diets containing 20, 16 and 17.5% protein and 2950, 2960 and 2750 Kcal energy were fed in group 1, group 2 and group 3, respectively for all the selected flocks.

The chickens health was closely monitored for the entire rearing period of 78 weeks. This included daily observation for clinical signs of affected birds and necropsy of dead birds. The observation results were noted.

Criteria for diagnosis of diseases: Diagnosis of diseases was made on the basis of history, signs and symptoms prior to death of birds, post-mortem lesions of dead birds by post mortem examination, supported by microbiological examination when indicated, using standard methods for bacterial identification (OIE manual, 2000; Bains, 1979; Gordon and Jordon, 1985).

Salmonellosis was diagnosed on the basis of cultural characteristics of *Salmonella* from the internal part of liver and spleen of dead birds with sign of yellowish diarrhea and was found enlargement and hemorrhages of liver and spleen and distinctive greenish bronze sheen on the surface of liver under post-mortem examination and specific antibody test. Colibacillosis was diagnosed on the basis of cultural demonstration of *E. coli* from internal part of liver in birds with gross pathological lesions as air sacculitis, perihpatitis, peritonitis, enteritis and congested liver on post mortem examination. Infectious coryza was diagnosed on the basis of clinical signs of swollen face and sinus with clear discharge progressively became purulent, marked conjunctivitis, partially or completely closed eyes and catarrhal inflammation of the nasal passages and subcutanceous edema of the face and wattles observed on Post-Mortem (PM) examination. Necrotic enteritis was diagnosed on the basis of symptoms of the disease prior to death and post-mortem finding of pseudomembranous enteritis. Omphalitis was diagnosis on the basis of signs of distended abdomen, inflammation on the navel region with unabsorbed yolk on PM examination. Mycoplasmosis was diagnosed on the basis of signs of labored breathing, gurgling sound with mucopurulant exudate in air sac and congested lungs. Gumboro was diagnosed on the basis of history of high morbidity and mortality of young birds and swollen, edematous and hemorrhagic bursa of fabricius and hemorrhagic leg and thigh muscles on post-mortem examination. Newcastle disease was diagnosed on the basis of history of high morbidity, signs of respiratory, digestive and nervous systems and proventriculus hemorrhage and intestinal plug. Lymphoid leukosis was diagnosed on the basis of history of disease out break after 20 weeks of age and large tumors occurring in visceral organs especially in liver and spleen on post mortem examination. Coccidiosis was diagnosed on the basis of sign of blood in the faces and caeca distended with blood and thickening of intestinal wall observed on post mortem examination and identification of coccidian oocyst by microscopic examination. Aspergillosis was diagnosed on the basis of history of labored breathing and gasping and yellowish nodules found in the lungs on post mortem examination, which was homogenous in consistency. Aflatoxicosis was diagnosed on the basis of sign of poor egg shell quality increased blood spots on the eggs and friable yellow colored liver with hemorrhages and laboratory demonstration of aflatoxin by feed culture on Sabouraud's Dextrose Agar (SDA). Egg bound condition was diagnosed by gross pathological examination. Heat stroke was diagnosed on the basis of history of high ambient temperature associated with onset of sudden death, epicedial and endocrinal hemorrhages, mature egg in oviduct and negative bacterial culture from internal organs. Malnutrition was diagnosed on the basis of history of emaciated body, weakness and atrophied muscles and negative microbiological finding from internal organs. Egg peritonitis was diagnosed on the basis of injuries in the peritoneum and inflammation on PM

examination. Cannibalism was diagnosed on the basis of sign of external injuries in the vent region,anemic carcass tow picking, tail picking and body picking were observed and negative bacterial culture from internal organs.

A total of 8169 dead birds samples which included of chicks 2960, grower 1083 and adult 4126 were collected aseptically from different flocks of different selected poultry farms in Bangladesh. The samples were carried to the laboratory of CDIL for the post mortem examination and collected different organs like liver, spleen, intestine in sterile containers for the identification of causal agents of diseases.

Dead birds: Post-mortem examinations of dead birds from different experimental groups were performed in all cases. Specimens like liver, spleen, intestine were considered to be significant for collection in separate sterile containers for the isolation and identification of causal agents using bacteriological examination.

Inoculation of different samples inoculum on to the bacteriological media: Nutrient agar, Blood agar, EMB agar and Mac Conkey agar plate etc were used for the detection of bacteriological isolates from different types of samples of dead birds. For bacteriological examination, the inoculums of the specimen were inoculated onto blood and Mac Conkey agars. The isolation procedures were followed by OIE manual, 2000, Manual of veterinary investigation laboratory techniques, 1984 and A laboratory manual for the isolation and identification of avian pathogens, 1998.

Culture of post mortem viscera of dead birds samples: For the samples of dead birds, the surface of the collected organ was seared with hot spatula and a sample was obtained by inserting a sterile wire loop through the heat sterilized surface and were streaked onto the plates of blood agar and Mac Conkey agar and incubated at 37°C and observed following day.

Examination of the plates: All plates were examined after incubation of 24 h at 37°C and noted the observation.

RESULTS

An observation study was conducted on the selected poultry flocks of different selected poultry farms in selected areas for the identification of the diseases of poultry. The diseases were determined based on history of the diseases, signs and symptoms of affected birds prior to death, post mortem examination of the dead birds of different age groups by laboratory media inoculation method.

Rate of mortality of birds: A total of 8169 out of 40,000 birds died during the observation period of selected total flocks of 5 different poultry farms from different selected areas. The rate of mortality in total birds was 20.42. Among these,the rate of mortality in group 1, group 2 and group 3 were 7.4, 3.69 and 15.75, respectively (Table 1). The highest number of mortality was recorded in group 3 (15.75%) followed by group 1 (7.4%) and group 3 (3.69%).

Diseases at different stages of birds: At the time of conducting the experiments for the detection of bacterial diseases in poultry, there were different types of causes of mortality of birds were observed. The number and rate of mortality in-group 1, group 2 and group 3 were due to different diseases shown in Table 2. In group 1, the rate of mortality due to salmonellosis was 27.80, colibacillosis 6.89, infectious coryza 0.3, omphalitis 14.66, necrotic enteritis 0.61, mycoplasmosis 1.32, gumboro 25.57, aspergillosis 1.01, coccidiosis 15.51, malnutrition 0.91, cannibalism 2.20 and unidentified 3.21. In group 2, the rate of mortality of birds from different poultry flocks in different areas due to salmonellosis, colibacillosis, infectious coryza, necrotic enteritis, gumboro, aspergillosis, coccidiosis, malnutrition, cannibalism and unidentified were 28.16, 6.00, 15.05, 1.11, 9.60, 4.71, 20.13, 2.59, 6.00 and 6.65, respectively. In group 3 the rate of mortality among the all selected poultry farms all together due to salmonellosis was 24.53%, infectious coryza 2.81%, necrotic enteritis 0.68%, m ycoplasmosis 17.98%, newcastle disease 20.12%, avian leukosis 4.31%, aflatoxicosis 10.59%, egg bound 4.39%, egg peritonitis 0.58%, malnutrition 1.50%, cannibalism 1.67%, heat stroke 8.29% and unidentified 2.54%.

Bacterial diseases at different stages of birds: For the present study,the mortality of the birds in different age groups due to bacterial diseases is shown in Table 3. In group 1, altogether 1527 bacterial diseases comprising of salmonellosis 823(53.90%), colibacillosis 204(13.36%), infectious coryza 9(0.59%), omphalitis 434(28.42%), necrotic enteritis 18(1.18%) and mycoplasmosis 39(2.55%) were found. In group 2, altogether 545 bacterial diseases were found which included salmonellosis 305(55.96%), colibacilosis 65(11.93%), infectious coryza 163(29.91%) and necrotic enteritis 12(2.20%). Mycoplasmosis was not found in this group. In group 3, altogether 1898 bacterial diseases comprising of highest incidence of salmonellosis 1012(53.32%) followed by mycoplasmosis 742(39.09%), infectiouscoryza 116(6.11%) and necrotic enteritis 28(1.48%).

A significant difference at 0.01 probability level in the distribution of bacterial diseases of colibacillosis, infectious coryza and mycoplasmosis in different age

Table 1: Total number and rate of mortality of birds at different ages

Group	Group 1 (Chick)	Group 2 (Grower)	Group 3 (Adult)	Total
Particulars				
Initial no. of birds	40.000	29.320	26.190	
Number of death	2960	1083	4126	8169
Rate of mortality	7.40	3.69	15.75	20.42

Table 2: Various microbial and nonpathogenic diseases responsible for the death of the birds at different stages

	Chicks		Grower		Adult	
Causes of mortality	No. of dead birds	(%) dead birds	No. of dead birds	(%) dead birds	No. of dead birds	(%) dead birds
Bacterial diseases	1527	51.59	545	50.32	1898	46.00
Salmonellosis	823	27.80	305	28.16	1012	24.53
Colibacillosis	204	6.89	65	6.00	0.0	0.0
Infectious Coryza	9	0.30	163	15.05	116	2.81
Omphalitis	434	14.66	-	-	-	-
Necrotic enteritis	18	0.61	12	1.11	28	0.68
Mycoplasmosis	39	1.32	0.0	0.0	742	17.98
Viral diseases	757	25.57	104	9.60	1008	24.43
Gumboro	757	25.57	104	9.60	0.0	0.0
Newcastte disease	0.0	0.0	0.0	0.0	830	20.12
Avian Leukosis	0.0	0.0	0.0	0.0	178	4.31
Fungal diseases	30	1.01	51	4.71	437	10.59
Mycotoxicosis	0.0	0.0	0.0	0.0	437	10.59
Aspergillosis	30	1.01	51	4.71	0.0	0.0
Protozoal diseases	459	15.51	218	20.13	0.0	0.0
Coccidiosis	459	15.51	218	20.13	0.0	0.0
Noninfectious diseases	92	3.11	93	8.59	678	16.43
Egg bound	-	-	-	-	181	4.39
Egg peritonitis	-	-	-	-	24	0.58
Malnutrition	27	0.91	28	2.59	62	1.50
Cannibalism	65	2.20	65	6.00	69	1.67
Heat stroke	0.0	0.0	0.0	0.0	342	8.29
Unidentified	95	3.21	72	6.65	105	2.54
Total	2960		1083		4126	

Table 3: Number of birds died of bacterial diseases at different stages

	Chicks		Grower		Adult		
Causes of mortality	Total positive No.	Rate of positive (%)	Total positive No.	Rate of positive (%)	Total positive No.	Rate of positive (%)	Chi-square value for testing equality of proportions
Salmonellosis	823	53.90	305	55.96	1012	53.32	1.19 NS
Colibacillosis	204	13.36	65	11.93	0.0	0.0	265.63 **
Infectious Coryza	9	0.59	163	29.91	116	6.11	520.21 **
Omphalitis	434	28.42	-	-	-	-	-
Necrotic enteritis	18	1.18	12	2.20	28	1.48	2.93 NS
Mycoplasmosis	39	2.55	0.0	0.0	742	39.09	869.67 **
Total	1527	100	545	100	1898	100	
Chi-square value for testing similarity on the distribution pattern of diffirent types of bectarial diseases causing death of diffirent stages of birds (chicks, growers and adults).			Chicks vs Growers = Chicks vs Adults = Growers vs Adults =			5659.73736 ** 7834.246897 ** 496.7901299 **	

Means disease never occurs at these ages, ** = significant at 0.01 probability level, NS = Not Significant

groups of birds was observed. No significant difference was observed in the distribution of salmonellosis and necrotic enteritis in all age groups of birds (Table 3).

The death of birds in all age were the highest due to bacterial diseases and lowest due to fungal and non infectious causes. Protozoal diseases was found in chicks and grower stages but not found in adult. The findings of the present study agree with the findings of Talha *et al.* (2001).

The distributions of chicks, growers and adults affected by different diseases were not the same as indicated by highly significant value of x^2 for goodness of fit. However, bacterial disease was found to be most severe, i.e., causing death for major portion of birds in all three stages. In chick and grower stages, the proportion was almost the same (52% for chicks and 50% for growers), but in adult stage the proportion was relatively, lower (46%).

DISCUSSION

Among the bacterial diseases the overall incidence of salmonellosis was the highest in the whole population of birds in group1, group 2 and group 3 (Table 3). A similar

finding was reported by shimizu *et al.* (1998). They reported that the mortality of layer birds due to salmonellosis was 36-48%. With the great expansion of the poultry rearing and farming salmonellosis has become wide spread problem in Bangladesh like other areas of the world (Amin *et al*., 1969; Sarker, 1976; Rahman *et al*., 1979). The incidence rate was 0-10%, mortality rate 40-45%, egg production reduction rate 20-30% and hatchability reduction rate 20-30%. The findings of the present study closely agree with the findings of Bhattacherjee *et al.* (1996). Mortality of birds in different stages very from negligible to 10 to 80% or higher in severe outbreaks of salmonellosis (Williams *et al*., 1990; Kumar and Kaushik, 1988). Much higher prevalence rate of 33.8% in individual birds and 71.2% on a flock level have previously been reported in Tanzanian scavenging local chickens (Minga *et al*., 1987) using serological test.

The mortality of birds in different age groups due to mycoplsmosis varies from 2.55 to 39.09% (Table 3). The findings of the present study are similar to the findings of Saif-Edin *et al.* (2000). They reported that the morbidity and mortality rates were variable in different breed and age of birds, ranging from 15-80 and 1.5-30% in native and broiler flocks, respectively. The results of the present study also supports the finding of Zhang *et al.* (1989) Shukla *et al.* (1985). The incidence of colibacillosis varies from 11.93 to 13.36% based on age groups. The result of the present study agrees well with the finding of Sharma and Kaushik (1986). They reported that the highest mortality of chicks due to colibacillosis was 28.38% during summer and lowest (8.98%) during rainy season. They also reported that coliform infections caused highest mortality in 0-5 weeks and lowest mortality in 21-25 weeks of age group. These reports are closely related to the present findings. A similar finding was reported from Bangladesh by Bhattacharjee *et al.* (1996). The findings of the present study also agreed with the findings of several workers (Ashton, 1990; Mario Padron, 1990; Gast, 1997).

The proportion of birds died of bacterial disease was the highest for salmonellosis (53.32-53.90%) and lowest (1.18 to 2.20%) for necrotic enteritis (Table 3) but not significantly different among the age groups. The effect of other bacterial diseases on the death of birds was not the same for different age groups but significantly different. This result might be for the uncontrolled proliferation of the bacteria due to absence of in-feed antibiotics. It was reported that *Salmonella* causes clinical signs and lesions in young chicks (Mario Padron, 1990; Gast, 1997). This case has shown that in the absence of in-feed and in-water antibiotics preventive, environmental and production stress and the existence of concurrent infections may cause development of clinical salmonellosis and colibacillosis and other bacterial diseases in chickens. Occurrence of the bacterial diseases,despite the first 5 days preventive antibiotic administration, indicate that this preventive measure was insufficient to prevent or control the development of disease. According to the present findings, the disease situation in the layer and parent stock flocks investigated is rather unsatisfactory, not only due to high flock mortality but also for the possibility of transmitting some diseases such as salmonellosis, mycoplasmosis at the field level through their progeny. These diseases are transmitted both vertically and horizontally (Wray *et al*., 1996). Important measures to improve the situation are the establishment and maintenance of specific pathogen free parent stock flocks and improvement of biosecurity of the rearing shed for the parent flocks, the hatcheries and the distribution chains. Previous studies reported the higher sero-prevalence of *Salmonella gallinarum* in commercial layer (Minga *et al*., 1988; Arbelot *et al*., 1997). It is however still clear that *Salmonella gallinarum* infection is a serious problem in commercial layers,probably as a result of intensive management and poor hygiene. The isolation rate of *Salmonella gallinarum* might have been higher if more than one plating media was used per sample as recommended by Wray *et al.* (1996).

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