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SEROPREVALENCE AND MORTALITY IN CHICKENS CAUSED BY PULLORUM DISEASE AND FOWL TYPHOID IN CERTAIN GOVERNMENT POULTRY FARMS IN BANGLADESH

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ABSTRACT

This study was conducted to determine the seroprevalence and mortality in chickens caused by pullorum disease and fowl typhoid in five different government poultry farms according to three age groups during the period from June' 2002 to May' 2003. The overall seroprevalence of salmonellosis, especially pullorum disease and fowl typhoid was 26.67%. The mean seropositivity of five farms in three different age groups from each farm was 18.97±2.27%, 33.20±3.53% and 27.84±2.67% on 10th, 24th and 40th week of age, respectively. The mean seropositivity of three different age groups from each farm was 36.77±5.40%, 24.05±3.97%, 26.80±3.90%, 25.77±4.49% and 19.93±3.28% in Mirpur, Savar, Bogra, Kishoregonj and Tangail poultry farm, respectively. Fowl typhoid caused by *S. gallinarum* was the most predominant organism accounting for 295 isolates, and only 74 isolates were identified as pullorum disease caused by *S. pullorum*. The highest mean proportion of mortality due to fowl typhoid among five farms was 43.36±2.39% and was highly significant (P<0.001) in 27 - 39 weeks age group. The proportion of mortality due to Pullorum disease was highly significant (P<0.001) in day 0 - 13 weeks age groups and in respect of age, the highest mean value of pullorum disease was 10.47±1.14 from five farms.

Key words: Seroprevalence, mortality, pullorum disease, fowl typhoid, chickens

INTRODUCTION

Salmonella gallinarum and *Salmonella pullorum* are non-motile and highly host adapted pathogenic avian serotypes, responsible for fowl typhoid and pullorum disease, respectively (Kwon *et al.*, 2000; Douglas and Alice, 1993). Chickens are the natural hosts for both *S. pullorum* and *S. gallinarum* (Calnek *et al.*, 1997). Pullorum disease is usually confined to the first 2-3 weeks of age, and occasionally occurs in adults (Calnek *et al.*, 1997). Fowl typhoid is frequently referred to as a disease of adult birds though there are reports of high mortality in young chickens (Christensen *et al.*, 1992). Lowry *et al.* (1999) reported that the mortality from pullorum disease as a result of horizontal transmission in non-treated contact chicks was approximately 68%. The pathological lesions of fowl typhoid generally do not differ significantly from what is observed in pullorum disease (Calnek *et al.*, 1997). Although some research reports on pullorum disease and fowl typhoid in chickens have been made in inland literature (Samad, 2000) but this paper describes the seroprevalence and mortality caused by pullorum disease and fowl typhoid in commercial chickens.

MATERIALS AND METHODS

This study was conducted in five different government poultry farms situated in Mirpur, Savar, Bogra, Kishoregonj and Tangail in two phases. In one phase, the seroprevalence of salmonellosis study was conducted only in living birds and in another phase, proportion of mortality due to fowl typhoid and pullorum disease were determined on bacteriological examination in three age groups from each of the five farms. The study was conducted during the period between June 2002 and May 2003.

Seroprevalence of salmonellosis

The total population in this study in three different age groups from five different government poultry farms was 15063 and collected total blood sample sizes were 1455. The blood samples were collected from living birds of the five farms on 10th, 24th and 40th weeks of age. The maximum numbers of birds were sampled to detect the seropositivity with a probability of 95% confidence interval and with a desirable error limit of 5%. 50 µL of fresh blood was used for whole blood rapid plate agglutination test as described by Anon. (1996). Nobilis® SP antigen (Intervet International B.V., Boxmer, Holland) belonging 1, 9, 12 antigenic factors was used in this study as reference antigen for the determination of seropositivity of salmonellosis. These tests developed visible agglutination when positive blood samples were mixed with this crystal violet colored antigen.

Proportion of mortality due to fowl typhoid and pullorum disease

In this study, a total of 1290 dead chickens out of 14142 study population from five different poultry farms considering the three different age groups were subjected to post mortem and bacteriological examination. The considered three age groups from each of the five farms were day 0 to 13th weeks, 14th to 26th weeks and 27th to 39th weeks of age.

Either liver, spleen, ovary, oviduct or yolk sac was considered as laboratory tissue samples. The surface of the liver, ovary, oviduct and unabsorbed yolk sac were seared, and its interior was sampled on sterile cotton swabs that were then streaked on blood agar (CM55, Oxoid Ltd., Hampshire, England) and MacConkey agar (1.05465, Merck, kGaA, Darmstadt, Germany) for culture. Lesions found were summarized, and a tentative diagnosis was recorded based upon anamnesis and lesions demonstrated. Suspected colonies from MacConkey agar were then transferred to triple sugar iron (TSI) agar slant. Polyvalent *Salmonella* 'O' antisera were used for serotyping. Dulcitol and ornithine decarboxylase were used to consider the biochemical differences between *S. pullorum* and *S. gallinarum*. *S. gallinarum* can ferment dulcitol, whereas *S. pullorum* can not do so and *S. pullroum* can ferment only ornithine decarboxylase, not dulcitol (Calnek *et al.*, 1997).

Statistical analysis

The data were analyzed by univariate and general linear model (GLM) procedures at 8.2 versions of SAS software. The Duncan's multiple range tests were also estimated by SAS software to locate the calculated means that were significantly different.

RESULTS AND DISCUSSION

Seroprevalence of salmonellosis

The overall seropositivity of salmonellosis in five different poultry farms in respect of three different age groups from each farm was 26.67% (Table 1). The highest seroprevalence was 45.36%, which was recorded from Mirpur Government Poultry Farm on 24th week of age (Table 1). The seropositivity of five different government poultry farms were 26.80%, 16.49%, 20.62%, 17.53% and 13.40% on 10th week, 45.36%, 29.90%, 34.02%, 32.99% and 23.71% on 24th week and 38.14%, 25.77%, 25.77%, 26.80% and 22.68% on 40th week at Mirpur, Savar, Bogra, Kishoregonj and Tangail Government Poultry Farms, respectively (Table 1).

Table 1. Seroprevalence of salmonellosis in five different government poultry farms of Bangladesh

Poultry Farms	Age (weeks)	No. of birds in the farms	No. of sera samples tested	Positive sera samples*	
				No.	%
MGPF	10th	1500	97	26	26.80
	24th	980	97	44	45.36
	40th	926	97	37	38.14
	Total	**3406**	**291**	**107**	**36.77**
SGPF	10th	1000	97	16	16.49
	24th	792	97	29	29.90
	40th	885	97	25	25.77
	Total	**2677**	**291**	**70**	**24.05**
BGPF	10th	1500	97	20	20.62
	24th	825	97	33	34.02
	40th	812	97	25	25.77
	Total	**3137**	**291**	**78**	**26.80**
KGPF	10th	1500	97	17	17.53
	24th	920	97	32	32.99
	40th	780	97	26	26.80
	Total	**3200**	**291**	**75**	**25.77**
TGPF	10th	1000	97	13	13.40
	24th	778	97	23	23.71
	40th	865	97	22	22.68
	Total	**2643**	**291**	**58**	**19.93**
Overall		**15063**	**1455**	**388**	**26.67**

*Serotested with commercial agglutination test kit (Intervet International, BV, Holland), MGPF = Mirpur Government Poultry Farm, SGPF = Savar Government Poultry Farm, BGPF = Bogra Government Poultry Farm, KGPF = Kishoregonj Government Poultry Farm, TGPF = Tangail Government Poultry Farm.

The mean seropositivity of salmonellosis in five farms in respect of three different age groups were 18.97%, 33.20% and 27.83% on 10th, 24th and 40th week. According to the farms, the mean seropositivity of salmonellosis were 36.77%, 24.05%, 26.80%, 25.77% and 19.93% in Mirpur, Savar, Bogra, Kishoregonj and Tangail Government Poultry Farms, respectively (Table 1). Similar reports were demonstrated by Muneer *et al.* (1988), Bouzoubaa *et al.* (1992) and Bhattacharjee *et al.* (1996). Bhattacharya and Majumder (2001) reported 37.76% and 68.84% sero-positive reactor birds from India. The overall seroprevalence of 26.67% recorded from this study coincide with the reports of Minga *et al.* (1987), Bouzoubaa *et al.* (1992) who recorded the overall seropositivity of 33.8%, 23.5% from Tanzania and Morocco, respectively but contradict the seropositivity of 51.9% recorded by Poppe *et al.* (1992) from Canada.

Proportion of mortality due to fowl typhoid and pullorum disease

This study was evaluated the baseline data of the proportion of mortality due to pulloum disease and fowl typhoid in Bangladesh. At necropsy, enlarged liver with congested and necrotic foci, splenomegaly, deformed ova, sulpingitis, peritonitis and unabsorbed yolk sac were the most commonly evident pathological findings for the identification of pullorum disease and fowl typhoid. Similar pathological changes for pullorum disease and fowl typhoid in the liver, spleen, heart, ovary and yolk sac were also reported by several authors (Barrow, 1993 and Shivaprasad, 2000).

A total of 74 isolates of *S. pullorum* and 295 isolates of *S. gallinarum* were isolated from 1290 collected dead samples during the field investigation (Table 2).

Table 2. Mortality of chickens caused by avian salmonellosis

Poultry farms	Age groups (weeks)	No. of birds	No. of birds died	*Salmonella* isolated			Pullorum disease*			Fowl typhoid*		
				No.	MT (%)	Proportion of MT (%)	No.	MT (%)	Proportion of MT (%)	No.	MT (%)	Proportion of MT (%)
MGPF	0-13	1450	128	33	2.28	25.78	16	1.10	12.5	17	1.17	13.28
	14-26	886	96	19	2.14	19.79	03	0.34	3.13	16	1.81	16.67
	27-39	835	89	45	5.39	50.56	02	0.24	2.25	43	5.15	48.31
	Total	**3171**	**313**	**97**	**3.06**	**30.99**	**21**	**0.66**	**6.71**	**76**	**2.40**	**24.28**
SGPF	0-13	1420	112	19	1.34	16.96	13	0.92	11.61	06	0.43	5.36
	14-26	875	87	20	2.29	22.99	03	0.34	3.44	17	1.94	19.54
	27-39	915	85	42	4.59	49.41	02	0.22	2.35	40	4.37	47.06
	Total	**3210**	**284**	**81**	**2.52**	**28.52**	**18**	**0.56**	**6.34**	**63**	**1.96**	**22.18**
BGPF	0-13	910	71	17	1.87	23.94	09	0.99	12.68	08	0.88	11.27
	14-26	930	75	11	1.18	14.67	01	0.11	1.33	10	1.08	13.33
	27-39	825	93	39	4.73	41.94	02	0.24	2.15	37	4.48	39.78
	Total	**2665**	**239**	**67**	**2.51**	**28.03**	**12**	**0.45**	**5.02**	**55**	**2.06**	**23.01**
KGPF	0-13	830	81	14	1.69	17.28	07	0.84	8.64	07	0.84	8.64
	14-26	890	73	14	1.57	19.18	02	0.22	2.74	12	1.34	16.44
	27-39	835	81	33	3.95	40.74	04	0.48	4.94	29	3.47	35.80
	Total	**2555**	**235**	**61**	**2.39**	**25.96**	**13**	**0.51**	**5.53**	**48**	**1.88**	**20.43**
TGPF	0-13	866	72	11	1.27	15.28	05	0.58	6.94	06	0.69	8.33
	14-26	855	75	16	1.87	21.33	02	0.23	2.67	14	1.64	18.67
	27-39	820	72	36	4.39	50.00	03	0.37	4.17	33	4.02	45.63
	Total	**2541**	**219**	**63**	**2.48**	**28.77**	**10**	**0.39**	**4.57**	**53**	**2.09**	**24.20**
Overall		**14142**	**1290**	**369**	**2.70**	**28.60**	**74**	**0.52**	**5.74**	**295**	**2.09**	**22.87**

*Causal agents were isolated and identified bacteriologically, MGPF = Mirpur Government Poultry Farm, SGPF = Savar Government Poultry Farm, BGPF = Bogra Government Poultry Farm, KGPV = Kishoregonj Government Poultry Farm, TGPF = Tangail Government Poultry Farm, MT = Mortality

The overall mortality in the five farms from pullorum disease and fowl typhoid were 0.52% and 2.09%, respectively and the overall proportion of morality were 5.74% and 22.87%, respectively (Table 2). According to the farms, the highest mean proportion of mortality due to pullorum disease among the three age groups was 6.71% in and due to fowl typhoid was 24.28% in Mirpur Government Poultry Farm (Table 2). According to the age groups, the highest mean proportion of mortality due to fowl typhoid among the five farms in respect of three age groups was 43.36% in

27-39 weeks age group and for pullorum disease, it was 10.47% in day 0 to 13 weeks age group. The similar study was also conducted by Hoque *et al.* (1992). There was no significant difference of fowl typhoid and pullorum disease in the selected farms, but fowl typhoid and pullorum disease were highly significant ($p < 0.01$) in different age groups. This epidemiological investigation was almost similar to the study conducted by Minga *et al.* (1987). It is recommended that this study confirm the seriousness of fowl typhoid infection in 27-39 weeks age group and pullorum disease in day 0 to 13 weeks age group. Therefore, it is suggested that particular attention should be paid to prevent pullorum disease and fowl typhoid, and appropriate policies must be taken to control or to eradicate fowl typhoid and pullorum disease from Bangladesh.

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